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ABSTRACT

This curriculum guide provides the plant science components of the vocational agriculture curriculum for Regional Vocational Agriculture Centers. The curriculum is divided into exploratory units for students in the 9th and 10th grades and specialized units for students in grades 11 and 12. The five exploratory units are: agricultural pest control; care and management of a vegetable garden; greenhouse business management; soils and fertilizer; and plant anatomy, physiology, and classification. production and marketing; floral design; fruit production; greenhouse crop production and marketing; greenhouse structures; interior landscaping; landscape construction; landscape design; landscape maintenance; nursery management; operation and care of horticultural equipment; perennial plant identification, production, and marketing; plant nutrition; plant propagation; retail flower shop management; turf management; vegetable producing and marketing; beekeeping; plant tissue culture; and hydroponic culture. Each unit contains these components: length (time); objectives; related job titles and relevant competencies; content outline; teacher and student activities; evaluation suggestions; bibliography; and individual teacher unit review. Validated competency lists and job descriptions for relevant job titles are appended. (YLB)

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REVISING AND UPDATING THE PLANT SCIENCE COMPONENTS OF THE CONNECTICUT VOCATIONAL AGRICULTURE CURRICULUM

Prepared by

AGRICULTURAL EDUCATION PROGRAM
DEPARTMENT OF EDUCATIONAL LEADERSHIP
SCHOOL OF EDUCATION
UNIVERSITY OF CONNECTICUT
STORRS, CONNECTICUT

Prepared for

CONNECTICUT STATE DEPARTMENT OF EDUCATION
DIVISION OF VOCATIONAL, TECHNICAL AND ADULT EDUCATION
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PREFACE

This printing of the Plant Science components of the suggested Connecticut Vocational Agriculture Curriculum has been designed for use in the Connecticut Regional Vocational Agriculture Centers. These centers are multi-staffed with three or more teachers of Vocational Agriculture who have each developed an expertise in one or more of the major areas of agriculture. The curriculum is based on the following major areas of agriculture: Animal Science, Plant Science, Agriculture Mechanics and Natural Resources.

This printing includes an emphasis in the Plant Science Curriculum on Technology. It is a reflection of the ever-changing field of Plant Science in Connecticut.

A full program of Vocational Agriculture is based on four years of enrollment. The student would, in the first two years, be enrolled in exploratory units of study covering all four major areas of study. Development of fundamental skills would be stressed during the exploratory units.

The third and fourth year of enrollment would be made up of an election of units designed to best prepare the individual student to meet his or her vocational objective in agriculture.

Students enrolled in the program will be involved in areas of study common to all of agriculture. These areas include career awareness, agricultural business management, leadership development through involvement in the Future Farmers of America chapter and the practical application of units studied through involvement with the supervised occupational experience program.

This revision includes the integration of a new section in each unit of instruction entitled, "Related Job Titles and Relevant Competencies" for Plant Science. The section is designed to highlight for teachers and students the potential employment or entrepreneurship job titles and relevant competencies needed for employment or self-employment success. The job titles and relevant competencies were identified and validated in the National Agriculture Occupations Competency Study and are included as an integral part of the curriculum.

The curriculum is organized and color coded for ease of use. The Plant Science Units are printed on green paper, just as they were in the original printing. The introductory material and Related Job Titles and Competencies are printed on white paper. The page numbers on the units of instruction are coded as follows:

EP - Exploratory Plant Science
SP - Specialized Plant Science

Exploratory units are generally appropriate for students in the ninth and tenth grades, while specialized units are designed for students in grades eleven and twelve.

The Related Job Titles and Relevant Competencies have two page numbers. They are numbered consecutively at the top. The number at the bottom refers to the Page number in the National Agriculture Occupations Competency Study. This page number is maintained for easy reference to the original document.

The organization for sequence of instruction will be at the discretion of certified teachers, administration, and consulting committee members in each center in accordance with availability of staff and facilities. The primary objective is to serve the individual interests and needs of the students.

The original development of the Plant Science Component of this curriculum involved the cumulative efforts of the staff of Plant Science teachers in Connecticut Regional Vocational Agriculture Centers. Teachers authored the units of study. Each unit was pilot tested by a teacher other than the author. Editing to produce a common format has been done by the teachers. It has not been possible to bring into this revised curriculum all of the information which is available. However, teachers are encouraged to use the curriculum as their basic teaching document and to supplement and enrich the curriculum as appropriate. It is intended that as additional information becomes available to teachers while using this curriculum, such information will be entered into the individual teacher's copy on the new unit evaluation form, for use in future curriculum revisions.

The Related Job Titles and Relevant Competencies were identified for each unit of instruction. Much time and effort was spent on identifying those validated activities needed by employed workers to help ensure that the curriculum is competency-based.

ACKNOWLEDGMENTS

The Project Director and Project Assistant wish to express their appreciation to those who have contributed to the success and completion of the curriculum. Ronald Carle, Sandy Dawson, James Dick, Robert Gambino, Francis Lineberry, Bruce Sahlin and Peter Wolcott contributed to the revision of specific units.

A sincere thank you is extended to the curriculum writers for their conscientious efforts throughout the project. Special recognition is due to Dr. Patrick B. Mullarney, Head, and Carol Lindlau, Secretary, Department of Educational Leadership, whose knowledge of University procedures and expert skills made the completion of the project possible.

Special appreciation is extended to Mr. Roger Lawrence, State Consultant, Vocational Agriculture, Mr. Milton Natusch, FFA Executive Secretary, Dr. Valerie Pichanick, Project Officer and Mr. Errol Terrell, Chief, Bureau of Vocational Services, for their involvement in the initiation and direction of the study. We would also like to extend our gratitude to Carolyn W. Sikora for her efficiency and expertise in entering the curriculum on the word processor. Her efforts will make future revisions of the curriculum much easier.

Finally, to the teachers of vocational agriculture in Connecticut, for whom this curriculum is designed to serve, appreciation is extended for their cooperation in providing input and support throughout the study.

Dr. Alfred J. Mannebach
Project Director

Brenda J. Johnson
Project Assistant

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*This column contains the original document page number.

PLANT SCIENCE CURRICULUM

UNIT: Agricultural Pest Control

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 9 or 10

OBJECTIVES: The students will be able to:

1. safely and correctly apply pesticides.
2. pass the examination for the operator's license from the state.
3. assess and make recommendations dealing with specific pest control.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Small Fruit Farming	169:2(b, f, g, m)
Tree Fruit Grower	191:8(a-k)
Vegetable Grower	195:2(a, b)
Chemical Applicator	198:1(a-f), 199:1(h), 199:2(a-e, i), 200:3(a-f, h), 201:3(j, k, l, n), 202:3(q-t), 202:4(a-c), 203:4(d-g), 203:5(a1-2), 205:6(a)
Arboriculture	408:6(a, b, g, k, m, n), 409:6(o)
Greenhouse Foreman	421:2(a-b), 422:3(a)
Greenhouse Worker	425:4(a-f), 428:12(a-p), 429:12(q, r), 429:13(a-j)
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CONTENT:

I. Career opportunities

II. Reasons for learning about pesticide

  A. laws and certification

III. Toxicity of pesticides

  A. kinds
  B. labeling
  C. first aid

IV. Ecology and environment

  A. protection
  B. food chain

V. Safety

  A. equipment
  B. storage
  C. mixing
  D. application
  E. records
  F. Federal and State regulations

VI. Types of pesticides

VII. Application

  A. the label
  B. formulations
  C. calculations
  D. equipment
  E. records

TEACHER ACTIVITIES:

1. Provide workbooks and assignments.

2. Provide materials for preserving, mounting, and labeling pests.

3. Provide texts for identification of pests and their control.

4. Provide examples of pests for identification and testing.

5. Demonstrate proper use of pesticide application and safety equipment.

6. Provide examples of labels and materials.

STUDENT ACTIVITIES:

1. Complete workbooks and assignments.

2. Identification of common insect disease, weed, and animal pests and their control.

3. Calibrate and adjust hydraulic sprayer, shop spreader and/or cyclone type spreader.

4. Simulate mixing, apply pesticides (simulate).

5. Neutralize or clean out sprayers (simulate).

6. Collect and properly preserve, label, and identify pest specimens.

EVALUATION:

1. Multiple choice and short answer test on factual information.
2. Test on pests and how to control.
3. Observation of safety procedures used by the students.
4. Student's collection.
5. Grade on Operator's License test.

BIBLIOGRAPHY:

References:

Colvin, T.S., Turner, J.H. Applying Pesticides. American Association for Vocational Instructional Materials.

Davidson, Ralph and Lyon. Insect Pests of Farm, Garden and Orchard. Wiley, 1986.

Farm Chemical Handbook. Meister Publishing Company, 1980.

How to Collect, Preserve and Identify Insects. Ext. Cir. 509, Coop Extension Service, Purdue University, Lafayette, Indiana.

Metcalf, C.L., Flint, W.P. Destructive and Useful Insects. New York City, New York: McGraw-Hill.

Pesticide Applicator Training Manual. Cornell University, 1980.

Pimentel, David. Handbook of Pest Management in Agriculture. CRC Publisher, 1986.

Pirone, P.P. Diseases and Pest of Ornamental Plants. New York City, New York: Ronald Press.

Selected Weeds of the United States. Agriculture Handbook #366, Agr. Res. Service, USDA Supt. of Documents, U.S. Government Printing Office, Washington, D.C.

Texts:

Roberts, Daniel A. Fundamentals of Plant Pest Control. Freeman, 1978.

MEDIA:

Filmstrips:

Calibrating 7 Applying Pesticide Safely - NASCO

Controlling Pests of Ornamental Plants - NASCO

Diseases of Garden Flowers - NASCO

Diseases of the Vegetable Garden - NASCO

Know Your Weeds - F302S, - Cornell, IMS

Understanding Safe Use of Pesticides - NASCO

Slides:

Diseases of Horticultural Crops

Fundamentals of Plant Identification - F304S, Cornell, IMS

Greenhouse Insect and Disease Control - Cornell, IMS

Identification of Greenhouse Pests - Cornell, IMS, 1976

INDIVIDUAL TEACHER UNIT REVIEW

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A. ADDITIONAL AND UPDATED TEACHING METHODS:

1. Student Activities--

2. Teacher Activities--

3. Evaluation Methods--

B. ADDITIONAL AND UPDATED REFERENCES:

1. Media--

2. Bibliography--

C. ADDITIONAL AND UPDATED RESOURCES INCLUDING ADDRESSES AND PHONE NUMBERS:

1. Resources Address Phone

D. WHEN TAUGHT AGAIN I WOULD MAKE THESE CHANGES:

1.

2.

3.

PLANT SCIENCE CURRICULUM

UNIT: Care and Management of a Vegetable Garden

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 9 or 10

OBJECTIVES: The students will be able to:

1. plan, sow seed, plant, care for, and harvest vegetables from the home garden.
2. take soil samples and submit to local extension center; and evaluate the garden's soil - both physically and chemically.
3. make a scale drawing of a garden and calculate the expected yield.
4. identify selected common vegetables.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Vegetable Grower	195:1(a-k), 195:2(a, b)

CONTENT:

I. Definition of a vegetable
   A. vegetable vs. fruit
   B. cool season vs. warm season

II. The vegetable garden
   A. importance of a plan
   B. site selection (water, light, soil, slope)
   C. soil test and interpretation
   D. planting
      1. seed vs. plants
      2. timing
      3. cool vs. warm season crops
      4. successive crops
      5. crop rotation

E. pest identification and control

    1. weeds
    2. insects
    3. animals
    4. diseases
    5. selection of recommended pest control methods
    6. Integrated Pest Management (I.P.M.)

F. harvesting and storage
G. post-season care of garden

III. The garden plan

A. definition of a scale drawing
B. garden size

    1. space available
    2. time available
    3. family harvest needs

C. draw a vegetable garden plan

    1. list varieties
    2. list expected yields for later comparison
    3. examples of successive plantings and crop rotation

TEACHER ACTIVITIES:

1. Introduce common vegetable crops.

2. Use lecture periods to explain the proper planning, planting, care and harvesting of vegetable crops.

3. Demonstrate how to take a soil sample and interpret the results.

4. Demonstrate the use of drawing equipment in creating a garden plan.

5. Demonstrate how to read and interpret various charts used to plan out space and harvest amounts.

6. Demonstrate how to read and interpret labels for appropriate fertilizers and pesticides.

STUDENT ACTIVITIES:

1. Maintain a notebook on lecture and discussion sessions.

2. Take test and interpret a soil test for a vegetable garden.

3. Draw a vegetable garden to scale; listing varieties and expected yield.
4. Interpret charts of expected yields and planting distances of varieties used in the garden plan.
5. Select pesticides and fertilizers recommended for vegetable garden use.
6. Complete I.D. cards on cultural requirements for selected vegetables.
7. Complete a seed catalog order form to correspond with garden drawing.

EVALUATION:

1. Review notebooks periodically.
2. Evaluate students' soil testing technique and interpretation of results.
3. Complete I.D. cards for selected vegetables.
4. Evaluate and correct student vegetable garden plan.

RESOURCES:

1. Drawing material.
2. Soil sample envelopes from agriculture experiment station or soil test kit.

BIBLIOGRAPHY:

References:

All About Vegetables. Ortho Books.

Carr, Color Handbook of Garden Insects. Emmaus, Pennsylvania: Rodale Press, 1979.

Garden Shortcuts. Ortho Books.

McCollum, Producing Vegetable Crops. Danville, Illinois: Interstate Printers and Publishers, 1980.

Ortho Problem Solver. Ortho Books.

Taylor's Guide to Vegetables and Herbs. Houghton-Mifflin, 1987.

Ware and McCollum. Raising Vegetables.

Texts:

Guide to Vegetables and Fruits. Ortho Books, 1982.

National Gardening Association, Gardening - The Complete Guide to Growing America's Favorite Fruits and Vegetables. Addison - Wesley Publishing, 1986.

Reiley, H. Edward and Shry, Carroll L. Introductory Horticulture - 3rd Edition. Albany, New York: Delmar Publishers Inc., 1988.

MEDIA:

Slides:

Diseases of the Vegetable Garden. University of Illinois.

Computer Software:

The Gardener's Assistant, Shannon Software Ltd., 1984.

Ortho's Computerized Gardening

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2. Bibliography--

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1. Resources	Address	Phone

D. WHEN TAUGHT AGAIN I WOULD MAKE THESE CHANGES:

1.

2.

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PLANT SCIENCE CURRICULUM

UNIT: Greenhouse Business Management

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. become acquainted with career opportunities associated with the greenhouse business.
2. become familiar with methods of recordkeeping used in a greenhouse.
3. become acquainted with the operation of a greenhouse business.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Greenhouse Foreman	421:1(a-f), 421:2(a, b), 422:2(c-k), 422:3(1-e)
Flower Shop Manager	423:1(a-d), 423:2(a-h), 424:3(a-j), 424:4(a-f)
Greenhouse Worker	425:1(a-d), 425:2(a, b), 425:4(a-f), 426:4(g-p), 426:5(a-t), 426:6(a-i), 426:7(a-e), 427:8(a-j), 427:9(a-d, f-h), 427:10(a-n), 428:11(a-n), 428:12(a-q), 429:13(a-j), 429:14(a-n), 430:15(a-ff), 430:16(a, b), 431:17(a-j), 431:18(a-d)

CONTENT:

I. Career opportunities, wholesale and retail

  A. types of greenhouse operations

    1. fresh flowers
    2. flowering and holiday plants
    3. foliage plants
    4. bedding plants
    5. vegetables

II. Starting a greenhouse business

   A. investment considerations
   B. sources of capital
   C. assess profit potential
   D. analyze assets
   E. analyze market
   F. location

III. Services provided by trade organizations

   A. specific crop organizations
   B. nursery associations
   C. local organizations
   D. state organizations
   E. national organizations
   F. experimental station and extension services

IV. Business management

   A. accounting principles
   B. business use of computers
   C. employee productivity

V. Recordkeeping

   A. crops produced
   B. quantity produced
   C. quantity sold
   D. prices sold for
   E. cultural records
   F. environmental records
   G. computer assistance

VI. Merchandise planning and advertising, wholesale and retail

   A. purchasing
   B. pricing
   C. grades and standards
   D. packaging and shipping
   E. quality control
   F. advertising and marketing

TEACHER ACTIVITIES:

1. Arrange field trips to various greenhouses, both wholesale and retail. Develop worksheet or questionnaire for field trips.

2. Explain skills necessary for computer use.

3. Explain skills necessary for management of a greenhouse operation.

4. Orient students to the use and function of the school greenhouse.

STUDENT ACTIVITIES:

1. Visit various retail and wholesale greenhouses.
2. Students will use a computer for business and recordkeeping.
3. Students will maintain a notebook on lecture and discussion sessions.

EVALUATION:

1. Review student notebooks.
2. Evaluate learning through quizzes.
3. Evaluate student's work in computers.

RESOURCES:

1. Local greenhouses and school greenhouse.
2. School computer.

BIBLIOGRAPHY:

References:

Ball, George J. The Ball Red Book. Reston, Virginia: Reston Publishing Company Inc., 1985.

Beringer, Louis. Profitable Garden Center Management, 2nd Edition. Reston, Virginia: Reston Publishing Company Inc., 1982.

Nelson, Greenhouse Operation and Management. Reston, Virginia: Reston Publishing Company Inc., 1987.

Sullivan, Robertson, Staby. Management for Retail Florist. San Francisco, California: W.H. Freeman and Co., 1980.

Texts:

Boodley, The Commercial Greenhouse. Albany, New York: Delmar Publishing.

Frantz, Forrest. Successful Small Business Management. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1978.

MEDIA:

Filmstrip:

Greenhouse Maintenance - VEP

Slides:

Greenhouse Energy Management - VEP

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PLANT SCIENCE CURRICULUM

UNIT: Soils and Fertilizer

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 9 or 10

OBJECTIVES: The students will be able to:

1. state how and why soils differ.
2. list the components of soil, major soil separates (sand, silt, clay) and the soil textures they create.
3. list the soil nutrients essential for growth and their function and symptoms of deficiency.
4. define soil structure and list the factors that promote it.
5. define soil acidity and alkalinity in terms of PH and explain how PH effects growth.
6. list and compare types of fertilizers.
7. describe the functions and benefits of soil life.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Tree Fruit Grower	189:1(b), 189:3(a-g), 190:4(d-f), 190:6(a-i)
Greenhouse Foreman	422:2(d)
Greenhouse Worker	427:9(1-e), 427:10(a-n)
Grounds Supervisor	433:5(e, f), 433:6(e)
Grounds Worker	437:1(c, m)
Nursery Worker	446:1(e, f, h)
Plant Propagation	449:2(c, d, f, i)
Maintenance Worker	458:1(a-d), 458:2(d), 458:3(a)

CONTENT:

I. What is soil

II. Types of soil and their uses

III. Soil horizons/soil profile

IV. Soil texture

- A. sand
- B. silt
- C. clay
- D. soil texture triangle

V. Soil structure

VI. Soil nutrients

- A. organic matter
- B. cation exchange

VII. Soil acidity and alkalinity

- A. liming

VIII. Fertilizers

- A. organic
- B. inorganic

IX. Soil life

- A. organisms
- B. microorganisms

TEACHER ACTIVITIES:

1. Review content and concepts through lectures, handouts, media and text.

2. Provide study questions to monitor student progress.

3. Use land lab or outdoor site to study soil profiles, texture, and structure.

4. Provide soil sample mailers for students to use.

5. Illustrate fertilizing techniques in school greenhouse and land lab.

6. Visit fertilizer suppliers to study different types.

7. Visit the local soil conservation service.

8. Provide soil maps for student analysis.

STUDENT ACTIVITIES:

1. Maintain notebook of lecture notes and handouts.
2. Answer study questions.
3. Dig an observation hole to examine soil profile.
4. Take a soil sample of their home garden or lawn to send to UCONN for analysis.
5. Have students apply recommendations of soil tests, i.e., apply fertilizer to their lawn as prescribed by test.
6. Demonstrate mastery of concepts through quizzes and lab reports.

EQUIPMENT

1. Soil test kit.
2. A pH Meter.
3. Pails, shovels, clipboards.
4. Samples of various soil types.

RESOURCES:

1. "Connecticut County Soil Survey Maps", U.S.D.A. Experiment Station, Storrs, Connecticut.
2. "Connecticut County Soil Survey Book", U.S.D.A. Experiment Station, Storrs, Connecticut.

BIBLIOGRAPHY:

References:

A Connecticut Soils Primer. College of Agriculture, University of Connecticut, Storrs, Connecticut.

Donahue, Our Soils and Their Management. Danville, Illinois: Interstate Printers and Publishers.

Foster, Approved Practices in Soil Conservation. Danville, Illinois: Interstate Printers and Publishers.

Jones, Fertilizers and Soil Fertility. Reston, Virginia: Reston Publishing Company, 1979.

Ingeles, Jack. Ornamental Horticulture. Albany, New York: Delmar Publishing Co., 1985.

Texts:

Bosworth, Foster. Approved Practices in Soil Conservation. Danville, Illinois: Interstate Printers and Publishers, 1982.

Donahue, Our Soils and Their Management. Danville, Illinois: Interstate Printers and Publishers, 1983.

Jones, Fertilizers and Soil Fertility. Reston, Virginia: Reston Publishing Company, 1979.

Plaster, Edward. Soil Science and Management. Albany, New York: Delmar Publishing Co., 1985.

MEDIA:

Slides:

How to Take a Soil Sample - NASCO

Know Your Land - Ohio, 1979

Our Living Soil - NASCO

Soils as Ecological Resources - Cornell

Soil and It's Properties - Ohio, 1971

Timing Acid Soils - Ohio, 1971

INDIVIDUAL TEACHER UNIT REVIEW

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D. WHEN TAUGHT AGAIN I WOULD MAKE THESE CHANGES:

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2.

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PLANT SCIENCE CURRICULUM

UNIT: Plant Anatomy, Physiology, and Classification

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 9 or 10

OBJECTIVES: The students will be able to:

1. identify plant parts and their role in plant growth and reproduction.
2. describe plant growth processes.
3. list the requirements for plant growth and describe the general effects of a lack or an excess of the requirements.
4. describe how plants are classified.
5. identify plant taxonomic classifications.
6. recognize parts of plants that can be used for identification.
7. use scientific equipment to examine plant parts.
8. classify plants.
9. use a plant identification key.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Greenhouse Worker	427:10(g, j, k), 428:12(n) 429:15(f)

CONTENT:

I. Introduction

   A. reasons for knowing anatomy and functions
   B. applications for horticulturalists
   C. occupations which require knowledge of plant anatomy, classification and function
   D. value of plants, food, fiber, esthetic value

II. Plant parts and their function

A. stems

1. xylem
2. phloem
3. cambium
4. bark

B. roots
C. leaves
D. reproductive components

1. flowers
2. fruit
3. seeds
4. cones
5. spores

E. modifications

1. modified stems
2. modified leaves

III. Plant processes and their function

A. photosynthesis
B. respiration
C. transpiration

IV. Plant growth requirements and their function

A. water
B. light
C. nutrients
D. support
E. carbon dioxide
F. the effects of too little or too much of these requirements

V. Plant classification

A. growth habit (tree, shrub, vine, etc.)
B. herbaceous vs. woody
C. life cycle
D. evergreen vs. deciduous
E. use of scientific and common names
F. use of plant keys

VI. Use of scientific equipment to examine plants

A. magnifying glass
B. microscope
C. dissecting kit

TEACHER ACTIVITIES:

1. Use lecture periods to explain the various parts of plants, plant processes, growth requirements and plant classification systems.
2. Display plant material to demonstrate plant classification.
3. Use school grounds and greenhouse as a laboratory.
4. Demonstrate correct use of scientific equipment.
5. Describe the use of plant keys.

STUDENT ACTIVITIES:

1. Examine plant parts with and without the use of scientific equipment.
2. Draw and label plant structures.
3. View plants on the school grounds and in the greenhouse to study plant classification.
4. Study and document plant reactions to environmental changes.
5. Collect plant specimens to study plant parts and classification.

EVALUATION:

1. Review student notebooks periodically.
2. Evaluate student drawings.
3. Give written examinations on plant processes.
4. Give quizzes on identification of plant parts.
5. Have students outline the classification of selected plants.
6. Evaluate students on the correct use of scientific equipment.
7. Evaluate students on correct use of plant keys.

RESOURCES:

1. Greenhouse
2. Native plant material (school grounds).
3. Scientific equipment (microscope, magnifying glass, dissecting kit).

BIBLIOGRAPHY:

References:

Baurdendistel, Horticulture: A Basic Awareness. Reston, Virginia: Reston Publishing Company, 1979.

Nelson, Flower and Plant Production in the Greenhouse. IPP, 1978.

Texts:

Reiley and Shry, Introductory Horticulture. Delmar, 1988.

McDaniel, Gary L. Ornamental Horticulture. Reston, Virginia: Reston Publishing Company, 1982.

MEDIA:

Slides:

Flowers, Fruits and Seeds - NASCO
Fundamentals of Plant ID - Ohio
Life of the Green Plant - NASCO

Computer Software:

How Plants Grow: The Inside Story - SMC Software Systems
Exploring that Amazing Food Factory, The Leaf - SMC Software Systems

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PLANT SCIENCE CURRICULUM

UNIT: Bedding Plants

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12, Winter - Spring

OBJECTIVES: The students will be able to:

1. know various types of bedding plants.
2. understand that bedding plants require special environmental conditions to develop high quality plants.
3. understand that the time of sowing the seeds will determine the flowering time and plant size.
4. identify germinating mediums used for the propagation of bedding plants.
5. know the various types of plant containers used in the bedding plant industry.
6. produce several varieties of bedding plants from the seed sowing to flowering or maturity.
7. apply growth regulators in correct proportions and understand how these regulators affect the growth of the plant.
8. apply fertilizers and pesticides to develop high quality plants.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Floriculture Salesperson	418:3(a-c, f)
Floral Designer	420:3(b-c)
Greenhouse Foreman	421:1(a-g), 421:2(a-i), 422:3(a-c, e)
Greenhouse Worker	426:6(a, c, e), 427:9(a-h), 427:10(a-j), 428:10(k, l), 428:11(a, b), 428:12(a-k), 429:13(a-d), 429:14(a-n), 429:15(a-ff), 431:17(a-d, f-j), 431:18(a-d)

CONTENT:

I. Optimum growing conditions for bedding plants
    A. mist systems
    B. CO_2
    C. temperature
    D. water and feeding
    E. insects and disease

II. Scheduling the crop

   A. seed growing
   B. transplanting
   C. pinching
   D. time of bloom
   E. growth regulators

III. Bedding plant mediums

   A. pasteurization
   B. soil mediums
   C. soilless mediums

IV. Bedding plant containers

   A. market pack
   B. thin-walled plastic packs
   C. thick-walled plastic packs
   D. pots

V. Varieties and identification of bedding plants

   A. annuals
   B. biennials
   C. perennials

VI. Growth regulators

   A. types
   B. dilutions
   C. application methods

VII. Fertilizers

   A. liquid vs. dry
   B. rate and analysis
   C. schedule

VIII. Pest control

   A. damping off
   B. botrytis
   C. insects
   D. recognition and control

IX. Marketing

   A. wholesale
   B. retail
   C. preparation of flowers for market
   D. cost of production

X. Use of bedding plants

   A. shade
   B. sun
   C. landscaping principles regarding annuals

TEACHER ACTIVITIES:

1. Demonstrate the procedures for selecting bedding plant mediums.
2. Use lecture and laboratory periods to explain environmental conditions needed for high-quality bedding plants.
3. Provide information concerning the sowing dates of bedding plants.
4. Display plant containers for identification purposes.
5. Demonstrate the procedures followed in seeding, transplanting, and maintaining bedding plants.
6. Select and demonstrate proper procedures in using pesticides.
7. Discuss marketing of bedding plants.
8. Arrange field trips to local retailers and growers of bedding plants.

STUDENT ACTIVITIES:

1. Start bedding plants from seed and follow their plants through a desirable schedule until they are ready for marketing.
2. Keep records of sowing dates, transplanting dates, fertilizer and growth regulator dates.
3. Practice the following skills in lab: sowing, transplanting, fertilizing, mixing growth medias, use of growth regulators, insecticides, and pinching.
4. Design and plant an annual garden.
5. Make a cost analysis of a class project.

EVALUATION:

1. Check periodically the care being given to class project.
2. Evaluate quality of student-grown bedding plants.

3. Evaluate student log/record book of activities.
4. Supervise planting, evaluate design.
5. Give quizzes on skills obtained in lab.
6. Give test on the identification of bedding plants.

RESOURCES:

1. Visit large bedding plant grower in your area.
2. Visit local garden centers.

BIBLIOGRAPHY:

References:

Nelson, Kennard S. Flower and Plant Production in the Greenhouse. Danville, Illinois: Interstate Printers and Publishers, 1978.

Reilly, Ann. Park's Success with Seeds. Geo. Park Seed Co., 1987.

Taylor, Taylor's Guide to Annuals, Houghton-Mifflin Co., 1986.

Wright, John. Propagation: How to Grow Plants Using Seed, Cuttings and Other Methods. Blanford Press England, Sterling, 1985.

Texts:

Ball, George J. The Ball Red Book. Reston, Virginia: Reston Publishing Company Inc., 1985.

Ortho, All About Annuals. Ortho Books, 1985.

Reiley, Shry, Introductory Horticulture. Albany, New York: Delmar Publishing Co., 1988.

MEDIA:

Filmstrips:

Annuals - IL
Bedding Plants - VEP
Bedding Plant Production - VEP
Garden Flower Annuals - VEP
Greenhouse Production of Bedding Plants - VEP

Slides:

Easter Lilies - VEP
Pot Mums
Preparing Peat Lite Mix

INDIVIDUAL TEACHER UNIT REVIEW

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2. Teacher Activities--
3. Evaluation Methods--

B. ADDITIONAL AND UPDATED REFERENCES:

1. Media--
2. Bibliography--

C. ADDITIONAL AND UPDATED RESOURCES INCLUDING ADDRESSES AND PHONE NUMBERS:

1. Resources Address Phone

D. WHEN TAUGHT AGAIN I WOULD MAKE THESE CHANGES:

1.

2.

3.

PLANT SCIENCE CURRICULUM

UNIT: Christmas Holiday Production and Marketing

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 and 12, December

OBJECTIVES: The students will be able to:

1. show familiarity with Christmas tree plantation establishment and care.
2. describe assembly-line production of Christmas wreaths.
3. demonstrate proper salesmanship and marketing techniques.
4. construct and decorate wreaths.
5. identify Christmas trees and greens.
6. display characteristics of leadership and responsibilities through group participation.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Floriculture Salesperson	418:3(a-h)
Floral Designer	420:3(a-g)
Flower Shop Manager	424:3(a-g, i, j), 424:4(a-f)

CONTENT:

I. Construction of wreaths

  A. hauling greens
  B. cutting to proper length
  C. tying
  D. decorating
  E. tagging
  F. pricing
  G. recordkeeping
  H. use and care of tools and equipment

II. Salesmanship and marketing

  A. setting up sales area
  B. grading, tagging and pricing trees
  C. display products for sale
  D. customer approach

- E. presenting the merchandise
- F. closing the sale
- G. making change
- H. keeping records of sales
- I. advertising

TEACHER ACTIVITIES:

1. Coordinate land-use and development of plantation.
2. Locate sources of greens.
3. Arrange with Board of Education and town officials for development.
4. Demonstrate proper tree planting, care and harvesting.
5. Demonstrate U.S.D.A. Grading of Christmas trees.
6. Demonstrate wreath-making and decorating.
7. Demonstrate proper sales techniques.

STUDENT ACTIVITIES:

1. Plant, care for, and harvest trees.
2. Grade and price trees according to U.S.D.A. standards.
3. Make and decorate wreaths.
4. Sell trees and wreaths using accepted sales procedures.

EVALUATION:

1. Observation of students work habits.
2. Records of all sales by each student.
3. Records of all production by individual students.
4. Written evaluation made of students production, work habits and attitudes after conference.
5. Grade given on production and sales.

RESOURCES:

1. Equipment

   A. truck
   B. chain saw
   C. bow saws
   D. clippers
   E. shears
   F. wire
   G. coat hangers
   H. ribbon
   I. cones
   J. tags
   K. order books
   L. pencils
   M. bow tying jig

BIBLIOGRAPHY:

References:

Dickson, A., and Winch, F.E. Selection and Care of Christmas Trees. Information Bulletin IB48, Ithaca, New York: Extension Service, N.Y.S. College of Agriculture and Life Sciences, Cornell University, 1982.

Dickson, A., and Winch, F.E. Shaping Christmas Trees for Quality. Information Bulletin IB81, Ithaca, New York: Extension Service, N.Y.S. College of Agriculture and Life Sciences, Cornell University, 1985.

Fox, Raymond. Christmas Decorations. Information Bulletin 141IB134, Ithaca, New York: Extension Service, N.Y.S. College of Agriculture and Life Sciences, Cornell University, 1986.

Gambino, R.B. How to Tie a Bow on Bow-Rite. 4 Old Mill Road, New Milford, Connecticut.

United States Standards for Grades of Christmas Trees. Washington D.C.: U.S. Dept. of Agriculture, Agricultural Marketing Service.

Text:

Reiley, Shry. Introductory Horticulture. Albany, New York: Delmar Publishers Inc.

MEDIA:

Video:

Ritners, Christmas Designs

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PLANT SCIENCE CURRICULUM

UNIT: Floral Design

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. identify different design styles in floral arranging.
2. describe the basic principles of floral design.
3. describe the basic elements of floral design.
4. use appropriate color combinations in floral arrangements.
5. identify materials used in floral design/the floral industry.
6. select appropriate containers and materials for different types of floral arrangements.
7. construct various types of floral arrangements.
8. figure costs of completed designs.
9. package floral arrangements for display, sale and delivery.
10. describe the proper care of cut flowers and floral arrangements.
11. identify selected flowers.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Floriculture Salesperson	417:1(a-3, 417:2(a-g), 418:3(a-h)
Floral Designer	419:1(a-g), 419:2(a-f), 420:3(a-g)
Flower Shop Manager	424:4(a-f)

CONTENT:

I. Design styles in floral arranging

   A. line
   B. mass
   C. line-mass (American)
   D. naturalistic
   E. free-form
   F. abstract

II. Principles of floral design

  A. balance
  B. scale
  C. harmony
  D. rhythm
  E. repetition
  F. unity
  G. focus or accent

III. Elements of floral design

  A. line
  B. form
  C. space
  D. pattern
  E. texture

IV. Color concerns in floral arranging

  A. color terminology (use of the color wheel)

    1. hue
    2. tint
    3. tone
    4. intensity

  B. emotional responses to color

    1. warm colors
    2. cool colors
    3. symbolic significance of colors

  C. color harmony

    1. monochromatic color harmony
    2. analogous color harmony
    3. complementary color harmony

V. Identification of materials used in floral arranging

  A. plant materials

    1. fresh
    2. dried
    3. artificial

  B. containers
  C. holding materials
  D. accessories

VI. Creating various arrangements

  A. centerpieces - round and oval, vase arrangements
  B. one-sided arrangements - horizontal, vertical, Hogarth curve, inverted "T", right angle, Asymmetrical triangle, symmetrical triangle, crescent, circle, oval, zig-zag, spiral, diagonal, line, free-form
  C. baskets
  D. sprays
  E. bouquets
  F. nosegays
  G. corsages
  H. boutonnieres
  I. holiday arrangements
  J. wedding design
  K. funeral design
  L. other special occasions

VII. Figuring costs of floral arrangements

  A. cost of materials
  B. mark-up

VIII. Packaging floral arrangements for sale and delivery

  A. packaging cut flowers
  B. packaging floral arrangements for safe delivery
  C. packaging corsages, boutonnieres and nosegays

IX. Care of cut flowers and floral arrangements

  A. care of fresh flowers and fresh arrangements

    1. use of floral preservatives

  B. care of dried and artificial plant materials

X. Obtaining supplies for floral arranging

  A. wholesale floral supplier
  B. mail order supplier
  C. gathering natural materials

    1. preserving natural materials

TEACHER ACTIVITIES:

1. Use lecture periods to explain principles and elements of design and color concerns in floral design.

2. Display and describe different floral design materials.

3. Demonstrate the construction of various designs.
4. Arrange a field trip to a local retail florist.
5. Arrange a field trip to a wholesale floral supplier.
6. Supervise student floral design activities.

STUDENT ACTIVITIES:

1. Maintain a notebook on lecture and discussion sessions.
2. Explain the principles and elements of design and the appropriate use of color in floral design.
3. Choose materials for specific designs.
4. Create various designs.
5. Figure costs of materials and retail price of various arrangements.
6. Package floral arrangements for sale and delivery.

EVALUATION:

1. Review notebooks periodically.
2. Give oral and written tests on the principles and elements of design, the use of color, the different styles and types of floral arrangements and the care of floral arrangements.
3. Evaluate student's floral arrangements.
4. Test student's ability to figure costs of materials and retail prices of floral arrangements.
5. Test student's ability to package floral arrangements correctly.

RESOURCES:

1. Floral material and arranging.
2. Floral design magazines.
3. Local wholesale and retail florists.
4. Teleflora and FTD printed materials.

BIBLIOGRAPHY:

Reference:

Arranging Cut Flowers. Ortho Books, 1985.

Texts:

McDaniel, Gary L. Floral Design and Arrangement. Reston, Virginia: Reston Publishing Company, 1981.

Pfahl, Peter Blair. American Style Floral Arranging. Englewood Cliffs, New Jersey: Prentice-Hall, 1982.

Retail Floriculture Book II: Designing and Care of Flowers and Foliage. Ohio Agricultural Education Curriculum Materials Service, 1976.

MEDIA:

Slides:

Contemporary Flower Arrangement - IMS
Corsage Construction - Ohio
Designing with Flowers and Decorative Materials - Ohio
Dried Materials - Ohio
Floral Tributes - Ohio
Flower Arranging - Ohio
Silk Wedding Arrangements - Ohio

Videos:

Ikebana I - VEP
Ikebana II - VEP
The Joy of Flower Arranging I - VEP
the Joy of Flower Arranging II - VEP

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PLANT SCIENCE CURRICULUM

UNIT: Fruit Production

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 and 12

OBJECTIVES: The students will be able to:

1. be familiar with practices involved in the production and marketing of fruit.
2. acquire knowledge necessary to produce quality fruit.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Small Fruit Farmer	167:1(a, b), 168:1(d-i), 168:2(a-j), 169:3(a, c, d, f, g)
Tree Fruit Grower	189:1(b), 189:2(a-d), 189:3(a, c, f, g), 190:4(a-f), 190:5(a-e), 190:6(a-c), 191:8(a-h), 191:9(a, b, d), 191:10(a, b), 191:11(a, c), 192:13(a, b), 193:14(a-c)

CONTENT:

I. Small fruits - strawberries, grapes, blueberries, brambles
  A. site selection
    1. exposures
    2. acreage
    3. soils
  B. planting and care
    1. planting
    2. pruning
    3. harvesting
    4. storage
    5. pest control

II. Tree fruits - apples, peaches, pears, plums
  A. site selection
    1. exposures
    2. acreage
    3. soils

B. planting and care

1. planting
2. pruning
3. harvesting
4. storage
5. pest control

    a. Integrated Pest Management (I.P.M.)

III. Marketing

A. truck farming
B. roadside stand
C. pick your own
D. large scale production for supermarkets

TEACHER ACTIVITIES:

1. Arrange field trips to local orchards.

2. Prepare tools for pruning of fruit trees.

3. Collect specimens for class identification.

STUDENT ACTIVITIES:

1. Maintain a notebook on lectures, discussions, and field trips.

2. Prune fruit trees.

3. Prune small woody fruit.

4. Plan small orchard.

EVALUATION:

1. Review student notebooks.

2. Evaluate plants pruned by students.

3. Give identification test.

RESOURCES:

1. Local orchards.

BIBLIOGRAPHY:

References:

American Fruit Grower Magazine. Meister Publishing Company.

Bilderback, Diane. Backyard Fruits and Berries. Emmaus, Pennsylvania: Rodale Press, 1984.

Hill, Fruits and Berries for the Home Garden. Knoph.

Koster, Henry. How You Can Grow Luscious Fruit, Nuts and Berries, 1987.

Ortho, All About Growing Fruits and Berries. Ortho Publishing Co., 1982.

Texts:

Childers, Modern Fruit Science. Horticulture Pub., 1986.

Reiley and Shry. Introduction to Horticulture, 3rd Edition. Albany, New York: Delmar Publishing Co., 1988.

MEDIA:

Slides:

Growing Orchard Crops - VEP

Growing Apples and Pears - VEP

Video:

Training and Pruning Apple Trees - Forshey

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3.

PLANT SCIENCE CURRICULUM

UNIT: Greenhouse Crop Production and Marketing

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. develop competency in such practices as watering, propagation, fertilization, soil preparation and pest control.
2. understand the effects of photoperiods.
3. understand the grading, packing, and shipping of crops.
4. understand pricing and marketing.
5. understand the specific requirements of various greenhouse crops.
6. maintain accurate record of crop production.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Greenhouse Foreman	421:1(a, b), 421:2(a-1), 422:3(a, b)
Greenhouse Worker	425:2(a, b), 425:4(a-n), 426:5(a-3), 426:6(a, d), 427:9(a-d, f-h), 427:10(a-j), 428:11(a, b), 428:12(a-f, j, k), 429:13(a-d), 429:15(a-ff), 430:16(a, b), 531:17(a-d), 431:18(a-d)

CONTENT:

I. Identification of various crops

II. Cultural requirements of various crops

III. Propagation

   A. stock plants
   B. cuttings
   C. seeds
   D. other

IV. Recordkeeping and crop scheduling

   A. temperature
   B. application of pesticide, growth regulators, and fertilizer
   C. crop scheduling
   D. watering
   E. lighting

V. Grading and packaging flower crops

   A. care of finished crops

VI. Wholesale and retail sales

   A. marketing and advertising

VII. Cost accounting (profitability)

   A. heating
   B. labor
   C. supplies

TEACHER ACTIVITIES:

1. Use lecture periods to explain the various crops and their requirements.

2. Arrange field trips to various wholesale and retail greenhouses.

3. Arrange purchase and delivery of various greenhouse crops and materials.

STUDENT ACTIVITIES:

1. Maintain a notebook on lectures and greenhouse crop observations.

2. Assist in growing various various crops as well as maintaining, picking, grading and packing various crops.

3. Do cost analysis on crops.

4. Keep accurate record of crop production.

EVALUATION:

1. Review notebooks and greenhouse records periodically.

2. Observe student competency in working with various crops both in planting and growing.

3. Evaluate student cost records of crops.

RESOURCES:

1. Greenhouse and it's equipment or supplies.
2. Local greenhouses for field trips.
3. Wholesale greenhouse supplier.

BIBLIOGRAPHY:

References:

Boodley, James. The Commercial Greenhouse. Albany, New York: Delmar Publishers Inc., 1981.

Cornell Recommendations for Commercial Floriculture Crops - Part I. Cornell University, 1987.

Kiplinger, Commercial Flower Forcing. New York, New York: McGraw-Hill, 1978.

Nelson, FLower and Plant Production in the Greenhouse. Danville, Illinois: Interstate Printers and Publishers, 1978.

Nelson, Greenhouse Operation and Management. Reston, Virginia: Reston Publishing Co., 1981.

Texts:

Ball, George J., Ball Red Book. Reston, Virginia: Reston Publishing Co., 1985.

Reiley and Shry. Introductory Horticulture. Albany, New York: Delmar Publishers Inc., 1988

Periodical:

Ohio Florist's Association Bulletin

MEDIA:

Filmstrip:

Planting and Care of Hanging Baskets - NASCO

Slides:

Common Insects of Greenhouse Crops - Ohio
Disease of Greenhouse Flower Crops - Ohio
Managing Plant Health in the Greenhouse - Ohio, 1979
Poinsettias and Easter Lillies - NASCO
Pot Mums - Ohio, 1980
Potted Flowering Plant - Ohio, 1977

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1.

2.

3.

PLANT SCIENCE CURRICULUM

UNIT: Greenhouse Structures

LENGTH: Three to six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. identify the various types of greenhouse structures and their uses.
2. identify the parts of a greenhouse structure.
3. list the factors involved in building a greenhouse structure in any location.
4. describe the disadvantages and advantages of different types, sizes, and shapes of structures and coverings.
5. understand the proper terminology for greenhouse structures.
6. understand the construction and maintenance of structures.
7. describe the controlling light, temperature, humidity, and CO_2 levels in greenhouse structures.
8. describe the importance of proper ventilation in greenhouse structures.
9. understand the importance of the heating and cooling systems in the various structures.
10. describe the use of special structures for plant production including their construction and maintenance.
11. understand why there is a need for some special equipment in the growing of greenhouse crops.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Greenhouse Worker	430:16(a-c, i, j,), 431:17(b-j)

CONTENT:

I. Greenhouses are built with specific objectives in mind

A. hobbies
B. teaching

C. research
D. botanical gardens
E. commercial horticulture

II. Types of greenhouses and their use and construction

A. even span solitary
B. ridge and furrow
C. uneven span
D. Quonset hut or bartlett
E. gothic arch
F. trox (commercial)
G. panel houses
H. air supported
I. others
J. manufacturers of greenhouses

III. Special structures, construction, maintenance and use

A. coldframes
B. hotbeds
C. lath house or slatted shed
D. cloth house

IV. Factors to consider when locating a greenhouse range

A. access to a good road
B. nearness to electricity and an adequate supply of clean water
C. greenhouse should be build on deep, well-drained soil
D. good air and water drainage
E. do not build near trees or buildings as they will cause shade
F. do no build where limbs, stones or other debris may be dislodged and cause damage
G. be protected from strong winds and winter storms to help save fuel
H. locate close to market, and a source of reliable labor
I. a north-south orientation would be the best

V. Parts of a greenhouse

VI. Greenhouse terminology

VII. Glazing materials and primary requirements

A. glass
B. plastic films
C. polyethylene film
D. vinyl film (PVC)
E. mylar polyester film
F. fiber glass

VIII. Heating systems

A. steam
B. hot water
C. solar heat
D. unit heaters
E. forced air
F. radiant heat
G. electric

IX. Cooling systems

A. fan and pad
B. mist system
C. shading compound

X. Ventilation

A. ridge
B. plastic tubes
C. fans
D. ridge ventilators and at the eaves (sash)

XI. Controlling light, temperature, humidity and CO_2 in the greenhouse

A. light controls
B. temperature controls
C. humidity controls
D. CO2 control (generator, liquid, dry ice, alcohol)
E. atmospheric control for refrigeration

XII. Greenhouse benches and beds

A. type of material used for the benches
B. bench arrangement and dimensions
C. advantages and disadvantages of using benches for growing plants
D. rolling benches--ebb and flow type benches

XIII. Additional special equipment in modern greenhouses

A. fertilizer injection equipment
B. automatic watering systems--capillary mats
C. misting systems
D. bottom bench heat provided by heating cables
E. temperature alarms
F. day-night time clocks

TEACHER ACTIVITIES:

1. Arrange class field trip to several greenhouse ranges to familiarize students with the greenhouse structures and equipment.

2. If possible, develop a slide collection for classroom use as a follow-up at end of unit.

3. Provide laboratory demonstrations for the following: types of glazing materials, how to glaze a greenhouse, the parts of a greenhouse and others.

4. Provide classroom time for lectures and individual study.

5. Divide class into various groups and have each group prepare a bill of materials and equipment for different types of greenhouse structures for class presentation.

STUDENT ACTIVITIES:

1. Maintain notebooks on lectures and discussions.

2. Complete all worksheets, drawings, quizzes, outside reading or other assignments.

3. Repair and adjust any environmental control devices in the school greenhouse if possible and know how they are to operate. Make use of company manual.

4. Prepare a bill of materials for various greenhouse structures.

5. Prepare a list of equipment and costs for a greenhouse structure. (Might use the school greenhouse layout.)

6. Glaze a section of the greenhouse and/or cover a temporary greenhouse with plastic.

7. Demonstrate that they know how to provide proper ventilation for a greenhouse either by drawing or by use of a model. (It could be a class project by building one.)

8. Demonstrate that they know the various kinds of glazing material s and where they are used.

EVALUATION:

1. Check all notebooks on a weekly basis.

2. Evaluate student quizzes and tests (pre-test and post-test).

3. Evaluate class project.

4. Evaluate the student's bill of materials and equipment analysis.

5. Evaluate each student's laboratory technique.

6. Evaluate the field trip follow-up.

RESOURCES:

1. Invite a resource person from a large operation to discuss such subjects as atmospheric controls.

2. Cooperative Extension Service for resource personnel and/or publications such as bulletins, leaflets or other media.

3. Connecticut Florist Association.

4. Lord and Burnham Representative or other greenhouse manufacturer.

5. List of materials

   A. samples of all kinds of glazing materials
   B. materials for glazing temporary greenhouse (plastic)
   C. materials for glazing school greenhouse or other
   D. glazing tools
   E. greenhouse catalogs from various manufacturers
   F. hand tools for repair or maintenance of equipment in greenhouse
   G. materials for building a coldframe, lath house or cloth house, if one is to be built
   H. plans for building
   I. solar heat greenhouse

BIBLIOGRAPHY:

References:

Clegg, Peter and Watkins, Derry. The Complete Greehouse Book. Gardenway Publishing

McCullagh, James. The Solar Greenhouse Book. Emmaus, Pennsylvania: Rodale Press.

Nelson, Greenhouse Operation and Management. Reston, Virginia: Reston Publishing Co., 1981.

Pierce, John. Greenhouse Grow How. R.R. Donnelley & Sons Co., The Lakeside Press.

Planning and Management of Greenhouses. IMS Cornell.

Solar Greenhouses. Northeast Solar Energy Center, 70 Memorial Drive, Cambridge, Massachusetts 02142

Texts:

Ball, George J. The Ball Red Book. Reston, Virginia: Reston Publishing Co., 1985.

Bartok, John and Aldrich, Robert. Greenhouse Engineering. 1987.

Boodley, James. The Commercial Greenhouse. Albany, New York: Delmar Publishing Company, 1981.

MEDIA:

Filmstrip:

Greenhouses--Uses and Designs

Slides:

Greenhouses and Related Structures--Ag. Education Curriculum, Columbus, Ohio 43210

Plastic Greenhouses - Planning--Greenhouse Energy Management - Cornell, Ohio

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PLANT SCIENCE CURRICULUM

UNIT: Interior Landscaping

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. identify common plants used in interior designs.
2. determine the light and temperature requirements of interior landscape plants.
3. recognize the cause of abnormal plant growth conditions.
4. fertilize interior landscape plants.
5. select plants for a specific set of environmental conditions.
6. select appropriate soil mixtures for individual plants.
7. select containers appropriate for both the individual plant and it's location.
8. design an interior landscape.
9. determine rental, maintenance, and establishment costs for an interior landscape design.
10. identify sources of interior landscape materials.
11. establish an interior landscape.
12. maintain an interior landscape.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Greenhouse Worker	425:4(a-f), 427:10(a, e, g, j, k, l), 428:11 (a, b), 428:11(a-g), 429:14(g)
Floral Designer	420:3(c, e)
Flower Shop Manager	424:3(a, g), 424:4(b)
Landscape Planter	436:4(h, j, k), 436:5(b)
Greenhouse Foreman	421:2(a-c)

CONTENT:

I. Identification of interior landscape plants

II. Environment of interior landscape plants

  A. light
  B. temperature
  C. moisture
  D. fertility

III. Identify abnormal plant conditions

  A. yellowing
  B. leaf drop
  C. wilt
  D. spotting

IV. Maintaining interior landscape plants

  A. watering
  B. fertility
  C. controlling pests and diseases

V. Designing/establishing an interior landscape

  A. determining light levels
  B. selecting plants for existing environmental conditions
  C. selecting plants for function
  D. select appropriate soil mixtures
  E. select appropriate container
  F. provide drainage
  G. place plants in the landscape
  H. selecting plants for beauty

VI. Developing cost estimates

  A. rental contract
  B. maintenance contract
  C. establishment contract

VII. Maintain interior landscapes

  A. check for plant needs

    1. fertilize
    2. water
    3. pesticide
    4. clean

  B. trim/prune

TEACHER ACTIVITIES:

1. Provide material, illustrations, and slides of interior landscape plants for the students.
2. Demonstrate techniques of watering and fertilizing interior landscape plants.
3. Demonstrate methods of determining existing light levels.
4. Provide finished interior landscape plans for the students to study.
5. Provide trade journals which contain sources and prices of plant material.
6. Invite an interior landscaper to talk to the class.
7. Conduct field trips to shopping malls and other public places which contain interior landscapes.
8. Conduct field trips to interior landscape plant growers and wholesalers.

STUDENT ACTIVITIES:

1. Develop a card file containing descriptions of interior landscape plants and their environmental requirements.
2. Determine light levels for various rooms.
3. Water and fertilize plants growing in an interior landscape.
4. Design an interior landscape taking into consideration the existing light levels and function of the landscape.
5. Develop an establishment contract, rental contract, and maintenance contract for an interior landscape.
6. Establish an interior landscape borrowing plant material from a wholesaler if necessary.

EVALUATION:

1. Grade card file.
2. Rate ability to water landscape plants.
3. Rate ability to mix fertilizer and apply it to landscape plants.
4. Grade interior landscape design.

5. Grade establishment, rental and maintenance contracts.

6. Rate ability to establish an interior landscape.

RESOURCES:

1. Trade journals.
2. Wholesalers and growers of interior landscape plants.
3. Shopping malls, banks, etc., which contain interior landscapes.
4. Interior landscapers.

BIBLIOGRAPHY:

References:

Gaines, Richard L. Interior Plantscaping. New York: Architectural Record Books, 1977.

House Plant and Interior Design. Countryside Books.

Taylor, Taylor's Guide to Houseplants. Houghton-Mifflin Co., 1987.

Texts:

Furuta, Tok. Interior Landscaping. Reston, Virginia: Reston Publishing Company, 1983.

Manaker, George. Interior Plantscapes. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.

Reiley, Shry. Introductory Horticulture, 3rd Edition. Albany, New York: Delmar Publishing Co., 1988.

MEDIA:

Slides:

Diagnosing Problems on Indoor Plants - Ohio
Foliage Plants - Ohio, 1983
Foliage Plants in the American Home - University of Florida

Videos:

How Plants Grow: The Inside Story - Bridgewater, New Jersey: SMC Software
Selecting Indoor Plants - Pismo Beach, California: Photocom

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1.

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PLANT SCIENCE CURRICULUM

UNIT: Landscape Construction

LENGTH: Three to six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12, Fall or Spring

OBJECTIVES: The students will be able to:

1. become familiar with various structures used in the landscape.
2. become familiar with the various construction materials used in the landscape.
3. become familiar with estimating cost of material, supplies and labor.
4. become familiar with plant material, their growth habits and use.
5. demonstrate knowledge of planting procedures.
6. become familiar with landscape construction, equipment and tools.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Grounds Supervisor	432:5(a, b), 434:9(a-h)
Landscape Planter	435:2, 435:3(a-g), 435:4(a-h), 436:6(a-d)
Groundsworker	438:3, 438:4(a-i), 438:5(a-l)
Landscape Aide	440:1(a-e), 440:2(a-g), 441:4(a-g)

CONTENT:

I. Identifying landscape needs of family

II. Analyzing the site

III. Interpreting a landscape plan

IV. Selection of various landscape construction elements

- A. fences
- B. walls
- C. retraining walls
- D. patios
- E. decks
- F. outdoor fireplaces

V. Selection of construction material

- A. wood
- B. brick
- C. patio block
- D. cinder block
- E. railroad ties
- F. rock walls
- G. mulches
- H. other

VI Construction equipment tools

- A. hand tools
- B. power equipment

VII. Preparing the site

- A. grading
    - 1. slope
    - 2. drainage
- B. fitting plants to the design
    - 1. planting procedures

VIII. Plant material and habit

- A. vines
- B. ground covers
- C. trees, shrubs
- D. plant hardiness

IX. Estimating costs - preparing a bid

- A. practice basic math problems
    - 1. percent problems
    - 2. area problems
    - 3. volume problems
- B. material
- C. supplies
- D. labor
- E. profit
- F. overhead
- G. travel and contingencies

TEACHER ACTIVITIES:

1. Use lecture periods to identify landscape needs of the family.

2. Take field trips to compare various elements used in the landscape.
3. Use lecture periods to estimate costs of material, supplies and labor.
4. Use both lecture time and arrange for field trips to demonstrate use of plants in the landscape.
5. Use both lecture time and arrange for field trips to demonstrate use of plants in the landscape.
6. Assist in landscape construction project.

STUDENT ACTIVITIES:

1. Maintain a notebook.
2. Identify landscape needs of family.
3. Select various elements for their landscape plan.
4. Estimate cost of material, supplies and labor of his/her landscape plan.
5. Construct a section of fence, brick walk, or deck.
6. Install plants from a planting plan.

EVALUATION:

1. Review notebook periodically.
2. Have student demonstrate a landscape plan.
3. Have students critique sites visited.

RESOURCES:

1. Local family house and school grounds.
2. Local nurseries.
3. Local commercial landscapers.

BIBLIOGRAPHY:

References:

Carpenter. Landscape Contracts Manual. University of Connecticut

Giles. Landscape Construction Procedures. Stipes

Ingels, Jack. Landscaping, 2nd Edition. Albany, New York: Delmar Publishing Co., 1983.

Strom. Sight Engineering for Landscape Architects. Reinhold Publishing Company.

Texts:

Boudendistel, Robert. Lawn and Garden Construction. 1983.

Evans. Lessons in Estimating Landscape Costs. Cornell University, 1979.

Guidelines for Estimating Landscape Costs and Instructions for Completing Job Analysis Sheets and Cost Estimate Sheets. Department of Education, Cornell University, 1981.

Hannebaum. Landscape Operation - Management, Methods and Materials. Reston, Virginia: Reston Publishing Company, 1980.

Nelson, Jr., W.M.R. Landscaping Your Home. University of Illinois, 1984.

Peltier, Ruth A. Mathematics for Horticulture. Ohio Ag. Ed. Curriculum Materials Service, 1982.

Vander Kooi. Estimating and Maintenance Principles for Landscape Construction. Horticulture Publishing.

MEDIA:

Filmstrip:

Putting Plants in the Design - Illinois

Slides:

Landscape Construction Accessories - Illinois

Landscape Construction Series - 7 sets, NASCO

Plans, Planting, Bed Preparation - Illinois

Structure Seating, Play Areas - Illinois

Walks, Steps and Retaining Walls - Illinois

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PLANT SCIENCE CURRICULUM

UNIT: Landscape Design

LENGTH: Three to six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. develop an understanding of types of occupations in landscape design.
2. understand the importance of landscaping.
3. analyze various landscapes and their requirements.
4. determine the landscape needs of the site and occupants of the site.
5. develop various solutions to landscape problems.
6. gain knowledge about kinds of plants and their correct uses for a site.
7. develop the ability to estimate landscape costs.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Grounds Supervisor	432:3, 433:5(e, f, j), 433:6 (a-m)
Landscape Planter	435:3(a-g), 436:4(a, b, g, h, j, k, l, n)
Grounds Worker	437:1(m), 438:2(e, i, l, n)
Landscape Worker	440:1(a-e), 440:2(a-i)

CONTENT:

I. Occupations in the landscape industry
   - A. landscape architect
   - B. landscape designer
   - C. horticultural extension agent
   - D. landscape nurseryman

II. Importance of landscaping
   - A. landscaping for use
   - B. landscaping for beauty
   - C. landscaping increases property value

III. Analysis of landscape requirements

- A. site analysis
- B. on-site factors
    1. slope
    2. soil
    3. rock outcroppings
    4. water
    5. existing vegetation
    6. structures
    7. climate of site
    8. utilities
    9. legal aspects
- C. off-site factors
- D. analysis of family needs
    1. "Analysis of Family Needs Check-Off List"
- E. area layout plan

IV. Ideas for solving landscape problems

- A. layout of the landscape areas
    1. the public area
    2. the private area
    3. the service area
- B. ideas for involving landscape problems

V. Structures and plants

- A. planning landscape structures
    1. walks and drives
    2. walls
    3. fences
    4. terraces and lawns
- B. structural materials
    1. asphalt
    2. concrete
    3. brick
    4. flagstone
    5. loose aggregates
    6. wood
    7. garden lighting

C. the structural plan

    1. fixed features

D. the kinds of plants

    1. habit of growth
    2. hardiness
    3. maintenance
    4. fruit, flower, foliage, and branching characteristics
    5. evergreen and deciduous plant materials
    6. trees
    7. shrubs
    8. groundcovers
    9. vines

E. the planting plan

F. selection of plant materials

    1. environmental factors

        a. soil
        b. light
        c. moisture
        d. exposure
        e. hardiness zone

    2. plant identification for the finished landscape plan

G. estimating landscape costs

TEACHER ACTIVITIES:

1. Lectures and lab presentations.

2. Prepare handout material.

3. Prepare lab assignments.

STUDENT ACTIVITIES:

1. Maintain notebook.

2. Completion of lab assignments.

3. Completion of homework.

4. Draw and design home landscape.

EVALUATION:

1. Review notebook periodically.
2. Quizzes.
3. Evaluation of lab assignments.
4. Evaluation of homework.
5. Class participation.
6. Unit exam.
7. Evaluation of home landscape.

BIBLIOGRAPHY:

References:

Hannebaum. Landscape Design. Reston, Virginia: Reston Publishing Company, 1980.

Laurie, Introduction to Landscape Architecture, 2nd Edition. Elgiver Publishing Company.

Margaff, Landscape Drawing. IMS, Cornell.

Nelson, Jr., W.M.R. Landscaping Your Home. University of Illinois.

Newtown, Design on Land. Harvard University.

Taylor, Taylor's Guide to Shrubs. Houghton-Mifflin Company, 1987.

Text:

Leighton and Simonds. The New American Landscape Gardener. Emmaus, Pennsylvania: Rodale Press, 1987.

MEDIA:

Filmstrips:

Creating a Design
Introduction to Landscape Design
Landscape Design, Fundamentals of Good Design - Illinois
Landscaping Do's and Don'ts
Landscaping the Homestead

Slides:

Color it Green With Trees - IMS, Cornell

Landscape Design - IMS, Cornell

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PLANT SCIENCE CURRICULUM

UNIT: Landscape Maintenance

LENGTH: Three to six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. prune shrubbery and trees.
2. fertilize landscape plantings.
3. mulch and water landscape plants.
4. control weeds, insects, and diseases of landscape plants.
5. maintain lawns and flower beds.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Grounds Supervisor	432:2, 432:5(a-k), 433:6(a-f), 433:7, 433:8(a-h)
Landscape Planter	436:4(h, j-l, n)
Grounds Worker	437:1(b-m), 437:2(a-j, l, n), 438:3, 438:4(a-g)
Landscape Worker	440:1(a-c)
Retail Landscape and Garden Center Salesperson	443:3(a-c, e, h-j), 433:4(a-j, l-o, q), 444:6(a-k), 445:7(b, d, h, j-m, o)

CONTENT:

I. Pruning

   A. injured plants
   B. rejuvenation
   C. developing form
   D. maintaining formal hedges
   E. pruning shade trees

II. Fertilizing landscape plants

   A. trees and shrubs
   B. ground covers and vines
   C. turf areas
   D. fertilizing equipment
   E. types of fertilizers

III. Mulching landscape plants

  A. mulching materials

IV. Watering landscape plants

V. Weed control

  A. plant beds
  B. edging
  C. herbicides

VI. Insect and disease control

  A. identification of common insect and disease problems of landscape ornamentals

VII. Turf maintenance

  A. mowing
  B. watering
  C. fertilizing and lime application
  D. lawn renovation

TEACHER ACTIVITIES:

1. Demonstrate the proper methods of pruning.

2. Provide fertilizer schedules for landscape plants.

3. Demonstrate the proper methods of fertilizing landscape plants.

4. Provide samples of weeds, and insect and disease damage.

5. Discuss proper turf maintenance.

STUDENT ACTIVITIES:

1. Prune trees, shrubs and hedges.

2. Mulch landscape plants on school grounds.

3. Select and apply chemicals for weed, insect, and disease control.

4. Operate and maintain lawn mowers and lawn fertilizer spreaders.

5. Determine the amount of fertilizer needed for a turf area.

6. Maintain a portion of the school grounds.

7. Take field trips to observe professional landscape practice.

EVALUATION:

1. Rate pruning technique on assigned trees and shrubs.
2. Evaluate ability to select and apply mulch to landscape plants.
3. Evaluate ability to select and apply pesticide.
4. Evaluate ability to select and apply fertilizer to a lawn area.
5. Evaluate area of school grounds which was maintained by student.

RESOURCES:

1. Extension bulletins.

BIBLIOGRAPHY:

References:

Business Principles of Landscape Service. Ohio State.

Carpenter, Landscape Plan Maintenance Manual.

Evans, Lessons in Estimating Landscape Costs. IMS, Cornell, 1979.

Hannebaum, Landscape Operations - Management, Methods and Materials. Reston, Virginia: Reston Publishing Company, 1980.

Harris, Arboriculture, Care of Trees, Shrubs and Vines. Prentice-Hall.

Hill, Pruning Simplified.

Ingels, Landscaping: Principle and Practice.

Ortho, Ortho Problem Solver.

Penn St. University. Landscape Maintenance and Establishment.

Taylor, Taylor's Guide to Shrubs. Houghton-Mifflin Co., 1987.

Taylor, Taylor's Guide to Ground Covers, Vines and Grasses. Houghton-Mifflin, 1987.

Texts:

Douglas, William. Garden Design, History, Principles, Elements, and Practice. Simon and Schuster Publishing, 1984.

Leighton and Simonds. The New American Landscape Gardener. Rodale Press Inc., 1987.

Webb, David. Practical Landscaping and Lawn Care. Tab Books Inc.

MEDIA:

Filmstrips:

Landscape Maintenance Manual - 4 filmstrips and cassettes - VEP
Fertilizing Ornamental Plants - filmstrip and cassette - VEP

Slides:

Diseases of Landscape Ornamentals - Ohio
Environmental Injuries to Landscape Plants - Ohio
Insects and Insect-like Pests of Landscape Ornamentals -Ohio
Pruning Landscape Ornamentals - Ohio

Video:

Elements of Pruning - VEP

Computer Programs:

Horticulture Insects and Diseases - Ohio (Apple II+, IIe, IIc)
Landscape Maintenance - Ohio (Apple II+, IIe, IIc)
Pruning - Ohio (Apple II+, IIe, IIc)

INDIVIDUAL TEACHER UNIT REVIEW

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2. Bibliography--

C. ADDITIONAL AND UPDATED RESOURCES INCLUDING ADDRESSES AND PHONE NUMBERS:

1. Resources Address Phone

D. WHEN TAUGHT AGAIN I WOULD MAKE THESE CHANGES:

1.

2.

3.

PLANT SCIENCE CURRICULUM

UNIT: Nursery Management

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. explain the scope of the nursery industry.
2. propagate nursery stock.
3. describe the nursery field practices.
4. recognize common plant disorders.
5. describe storing, grading and marketing nursery stock.
6. keep records and accounts.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Nursery Worker	446:1(b, c, e, f, h), 446:2(a-f), 446:3(a-j), 447:4(a-e), 447:5(a-c), 447:7(a, b)
Plant Propagator	449:2(a-i)
Nursery Salesperson	453:1(a-j)

CONTENT:

I. Scope of nursery industry

    A. nursery industry in U.S.A. and Connecticut
    B. employment skills
    C. job titles
    D. new developments in industry

II. Identification of common nursery stock

III. Plant propagation methods

    A. cuttings
    B. grafting
    C. budding
    D. layering
    E. tissue culture

IV. Nursery field practices

    A. transplanting
    B. staking
    C. pruning
    D. irrigation
    E. harvesting
    F. selecting and maintaining tools

V. Controlling pests

    A. insects and related pests
    B. plant diseases
    C. other pests
    D. weed control
    E. safe use of pesticides

VI. Storing, grading and marketing

    A. storage
    B. grading
    C. advertising
    D. merchandising

VII. Keeping records and accounts

    A. record system
    B. order records
    C. reports
    D. pricing
    E. inventory

TEACHER ACTIVITIES:

1. Arrange class trip to a large commercial (wholesale) nursery.

2. Arrange class trip to local (retail) nursery for plant identification.

3. Arrange class trip to a large commercial nursery to observe propagators performing the various methods of propagation.

4. If the school does not already have a nursery, the teacher should make every effort to establish one for the good of the department, the school, and the community.

5. Arrange for local nurserymen to come to the Vocational Agricultural Department to discuss with the class, container grown stock, field grown stock, propagation methods, career opportunities, or any other subject pertinent to the class at any particular time.

6. Provide propagating bench in the greenhouse.
7. Provide lecture time in the classroom to discuss various principles and operations.
8. Conduct demonstrations where applicable for the different operations.
9. Obtain tissue culture kits for students.

STUDENT ACTIVITIES:

1. Maintain a notebook on all class lectures and discussions.
2. Learn how to propagate different types of nursery stock growing in the school nursery or the community.
3. Sow seed properly in the greenhouse.
4. Do a T bud on roses.
5. Take various cuttings from shrubs and other ornamentals in the school nursery or from the school grounds and propagate them.
6. Collect samples of diseases and insects of ornamentals, correctly identify them and how controlled.
7. Dig bare-root and B & B stock, grade them and label for identification.
8. Plant a container crop in the school nursery.
9. Propagate plants by tissue culture.

EVALUATION:

1. Provide students with a short pre-test at the beginning of the Nursery Management Unit.
2. Students will maintain notebooks during any and all classroom lectures and discussions.
3. Students' response to classroom discussion.
4. Quizzes to be provided at various intervals to include classroom work and laboratory experiences.
5. Students' ability to work to capacity during the laboratory period.

6. Post-test to be given at the end of the Nursery Management Unit.
7. Each student to be graded at the end of each laboratory exercise.

RESOURCES:

1. Contact local extension office for publications relating to the Nursery Management Unit.
2. Contact local area nurserymen to make a presentation on any subject area of concern to you.
3. Land Laboratory (School).
4. Overwintering hoophouse for container stock.
5. Tissue culture lab set up.

BIBLIOGRAPHY:

References:

American Association of Nurserymen. American Standard for Nursery Stock. Washington, D.C. 20005: AAN.

American Nurserymen. Chicago, Illinois: 310 S. Michigan Avenue, Suite 302.

1987-88 Cornell Recommendations for Pest Control for Commercial Production and Maintenance of Trees and Shrubs.

Davidson, Mecklenberg. Nursery Management. Prentice-Hall.

Hartley, Retailing. Houghton-Mifflin.

Horticultural Research Institute. Scope IV of the Nursery Industry. Washington, D.C. 20005: HRI, Inc., 1982.

Lassanske, Daniel E. Nursery Teacher's Survival Guide. San Luis Obispo, California: Vocational Education Productions, California Polytechnic State University, 1982.

Leighton and Simond. The New American Landscape Gardener. Rodale Press, 1987.

Roediger, Roger D. The Garden Center Worker. Columbus, Ohio: Ohio Agricultural Education Curriculum Materials Service, Ohio State University, 1979.

Texts:

American Standards for Nursery Stock
Nursery Crops and Landscape Designs for Agribusiness Studies
Nursery and Greenhouse Worker
Nursery Production (student handbook)
Nursery Production (teacher manual)
Ornamental Horticulture

MEDIA:

Slides:

Balling and Burlapping Trees and Shrubs - IL
Mechanical Digging of Trees and Shrubs - IL
Transplanting Nursery Stock - IMS, Cornell

Filmstrips:

Container Production of Nursery Stock - IL
Packaging of Trees and Shrubs - IL
Propagation of Evergreen for Nursery Production - IL
Propagation of Deciduous Shrubs for Nursery Production - NASCO, IL
Selecting Container Evergreens - NASCO, IL

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PLANT SCIENCE CURRICULUM

UNIT: Operation and Care of Horticultural Equipment

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. understand the use, service, and operation of basic horticultural equipment.
2. use safe operating procedures.
3. perform routine maintenance practices.
4. demonstrate proficiency and knowledge of equipment service and maintenance.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Arboriculture Worker	413:13(a-l)
Greenhouse Worker	426:7(a-g, i-m), 427:8(a-j)
Grounds Supervisor	433:7, 433:8(a-l)
Grounds Worker	438:3, 438:4(a-k)
Landscape Aide	441:5(a-f)
Nursery Worker	447:7(a-j)
Nursery Mechanic	451:2(a-f), 451:3, 451:4(a-e), 452:6
Golf Course Maintenance Worker	456:4(a-d, f, g)
Maintenance Worker	459:6(a-d)
Golf Course Mechanic	462:1, 462:2, 462:3, 462:6
Golf Course Irrigation Specialist	466:3

CONTENT:

I. Safety
  A. safety labels on machines
  B. operating machinery speeds
  C. handling equipment
  D. refueling
  E. cleaning and sharpening of equipment

II. Fuel

   A. storage containers
   B. storage location
   C. grade
   D. mixing fuel for various type engines

III. Operator's Manual

   A. read the instructions
   B. follow step-by-step procedures
   C. controls and instruments
   D. operation

      1. break-in procedures
      2. starting the engine or equipment
      3. stopping the engine or equipment
      4. operating function of various parts

   E. lubrication

      1. lubrication and maintenance chart
      2. fuels and lubricants
      3. service procedure
      4. general maintenance

   F. air cleaners

      1. replacement procedures or cleaning procedures
      2. length of time between service

   G. electrical

      1. spark plug servicing
      2. care and maintenance of ignition systems
      3. battery maintenance

   H. cooling system
   I. carburetion
   J. seasonal storage

      1. engine
      2. parts
      3. tools

TEACHER ACTIVITIES:

1. Demonstrate safe operating procedures.

2. Demonstrate servicing and maintenance.

3. Demonstrate various adjustments to be made on equipment.
    - A. measuring devices
    - B. seeding
    - C. fertilizer

STUDENT ACTIVITIES:

1. Maintain a notebook.
2. Use an operator's manual.
3. Perform maintenance functions.
4. Operate equipment safely.

EVALUATION:

1. Review notebook periodically.
2. Test or quiz frequently.
3. Evaluate actual maintenance and service.
4. Evaluate actual operation, safety and skills.
5. Unit exam.

RESOURCES:

1. Machinery dealers and their equipment.
2. School-owned equipment such as:

    rotary mower
    reel mower
    thatcher (mechanical rake)
    string edger
    blowers
    sprayers
    vacuum - leaf or grass
    aerators - spike and plug
    turf renovator
    chain saw
    fertilizer spreader - seed sower
    rotary seed sower and spreader
    small and midsize tractors
    pruning equipment
    power auger
    snow thrower
    water pump
    hand tools
    rototillers
    back hoe
    hydroseeder
    drill seeder

3. Students' and parents' equipment.

4. Town park and recreation department.
5. Local golf courses.
6. Local landscapers and grounds maintainers.

BIBLIOGRAPHY:

References:

Briggs and Stratton Parts Manual. Milwaukee, Wisconsin: Briggs and Stratton Corp. (yearly issues)

Briggs and Stratton Repair Instruction IV. Milwaukee, Wisconsin: Briggs and Stratton Corp. (yearly issues)

General Theories of Operation. Milwaukee, Wisconsin: Briggs and Stratton Corp. (yearly issues)

Gray, James A., and Barrows, Richard. Small Gas Engines. Englewood, New Jersey: Prentice-Hall, 1976.

Mechanics Handbook. Grafton, Wisconsin: Lauson, Tecumseh Corporation. (yearly issues)

Tecumseh Parts Manual. Grafton, Wisconsin: Lauson, Tecumseh Corporation. (yearly issues)

Text:

Drake, George. Small Gasoline Engines Maintenance, Troubleshooting and Repair. Reston, Virginia: Reston Publishing Co., 1981.

MEDIA:

Slides:

Troubleshooting Small Gas Engines of Lawn Mowers - Cornell
Using Power Lawn Mowers Safely - IL
Using Power Mower Safely - Cornell

Video:

John Deere Safety Programs, John Deere

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1.

2.

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PLANT SCIENCE CURRICULUM

UNIT: Perennial Plant Identification, Production and Marketing

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. identify selected perennials.
2. design a perennial border.
3. establish a perennial border.
4. describe cultural practices for selected perennials.
5. grow perennials from seed.
6. plan a schedule for sowing perennial seed at proper time of year.
7. describe the proper means of protecting plants over the winter.
8. start perennials using asexual propagation.
9. determine proper marketing procedures.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Greenhouse Foreman	421:2(a-h), 422:3(a)
Greenhouse Worker	426:5(a-q), 426:6(a, c, d), 426:7(a, b), 427:8(a-j), 427:9(a-d), 427:10(a-n), 428:11(a, b), 428:12(a-c, e-k), 429:13(a-j), 429:14(a-d), 429:15(a-h), 430:15(n-ff), 430:16(a-c, i, j), 431:17(a-j), 431:18(a-k)
Grounds Supervisor	433:7, 433:8(a-c)
Landscape Planter	436:4(h-n)
Retail Landscape and Garden Center Salesperson	442:2(a-h), 443:3(a-c, 3, h-j), 443:4(d-h, j, l-o), 445:7(a, c, d, h)

CONTENT:

I. Plant life cycles

II. Plant identification

III. Perennial garden design

   A. color
   B. height
   C. time of bloom
   D. balance
   E. texture

IV. Perennial garden establishment and maintenance

   A. preparation of soil
   B. planting
   C. nutrition
   D. cultivation
   E. watering
   F. staking
   G. protection

V. Propagation

   A. seed

      1. time of year
      2. direct vs. transplanting

   B. cuttings
   C. division

VI. Growing in containers

   A. transplanting
   B. watering
   C. growing medium
   D. fertility
   E. pest control
   F. winter protection
   G. use of coldframes and greenhouses

VII. Marketing

   A. wholesale vs. retail
   B. recordkeeping

      1. varietal popularity
      2. inventory on hand
      3. cost of materials
      4. cost of operations

   C. advertising

      1. highway signs
      2. newspaper advertisements
      3. radio and television
      4. open house
      5. direct mailings

D. display

1. organizing sales area
2. labeling
3. cultural information

TEACHER ACTIVITIES:

1. Provide pictures and slides of various perennials.
2. Conduct field trip to local perennial grower.
3. Provide students with examples of perennial garden design.
4. Demonstrate techniques of propagating perennials.

STUDENT ACTIVITIES:

1. Collect pictures from catalogs and prepare 5" x 8" cards with pictures and cultural information.
2. Maintain school perennial garden.
3. Design a perennial garden.
4. Germinate perennials from seed.
5. Take cuttings and divide perennials.

EVALUATION:

1. Evaluate student index of perennials.
2. Evaluate student garden design.
3. Give written examinations on content.
4. Evaluate student on ability to propagate perennials.

RESOURCES:

1. School perennial garden.
2. Garden design materials.
3. Propagation tools.
4. Greenhouse facility.

BIBLIOGRAPHY:

References:

Giles, Herbaceous Perennials. Reston, Virginia: Reston Publishing Co., 1980.

Hudah, Gardening With Perennials. Dexter Press, 1976.

Taylor, Taylor's Guide to Perennials. Houghton-Mifflin Company, 1987.

Nelson, W.R. Landscaping Your Home. University of Illinois, Cooperative Extension Service, 1984.

All About Perennials. Ortho Books, 1981.

All About Bulbs. Ortho Books, 1981.

Successful Gardening. Ortho Books, 1983.

Still, Steven. Herbaceous Ornamental Plants. Stipes Publishing Company, 1982.

MEDIA:

Slides:

Identification and Characteristics of Selected Biennials, Perennials, and Bulbs - Cornell
Perennial Plants for Garden Design - Cornell
Perennials - Ohio

Video:

Plant Propagation, Volume I - VEP

Software:

Ortho's Computerized Gardening - VEP

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PLANT SCIENCE CURRICULUM

UNIT: Plant Nutrition

LENGTH: Three to six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. understand the soil factors which influence plant growth and management and how these are essential for optimum growth and yield.
2. understand that physical and chemical properties of soils which will determine the crops growth and the management techniques.
3. test greenhouse and field soils accurately.
4. interpret soil tests results.
5. accurately apply soil additives.
6. correctly send samples to laboratory for testing and be able to interpret results accurately.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Greenhouse Foreman	422:2(d, e)
Greenhouse Worker	427:10(a-n), 429:14(b, d, g, h), 429:15(a-i)
Plant Propagator	449:2(a-i), 449:3(a-i), 450:5(d)
Nursery Salesperson	453:1(a-e, h)

CONTENT:

I. Soil science and plant growth
   - A. soil factors influencing plant growth
   - B. soil fertility and native vegetation
   - C. essential plant food elements (plant nutrients)
   - D. roles of the major and trace plant nutrients

II. Physical properties of soils
   - A. mechanical analysis
   - B. soil texture
   - C. soil structure
   - D. porosity and granulation

III. Soil formation and classification

- A. classification of parent materials
- B. materials transported by wind, water, ice, gravity
- C. disintegration and decomposition of soils
- D. soil maps and surveys

IV. Chemical and colloidal properties of soil

- A. colloidal clay
- B. humus
- C. cation exchange
- D. soil pH
- E. buffering
- F. fixation of elements

V. Life in the soil

- A. fungi and bacteria/nematodes
- B. nitrification
- C. plant roots
- D. soil

VI. Organic matter

- A. functions of organic matter
- B. chemical and biological properties of organic matter
- C. maintaining organic matter in the soil

VII. Soil water

- A. infiltration
- B. permeability
- C. soil water classified
- D. percolation
- E. leaching losses of nutrients

VIII. Fertilization

- A. uptake of nutrients
- B. fertilizers and their characterization
- C. use of fertilizers
- D. lime and liming practices

IX. Related topics to be covered in soils unit

- A. tillage
- B. soil conservation
- C. irrigation
- D. drainage
- E. manure, compost, ecology

TEACHER ACTIVITIES:

1. Use lecture periods to explain the soil factors that influence plant growth.
2. Demonstrate the procedures for taking soil sample and testing nutrient levels of greenhouses and field crops.
3. Plan a field trip to study soil formation and classification.
4. Prepare greenhouse laboratory projects on plant nutrition, i.e., essential elements for plant growth and their symptoms of deficiency.
5. Use lecture periods to discuss the use of synthetic and organic fertilizers and demonstrate the methods of application.

STUDENT ACTIVITIES:

1. Maintain a notebook on lecture and discussion sessions.
2. Answer study questions to be presented after each lecture.
3. Take soil samples.
4. Test their own field of garden soil for N.P.K., pH.
5. Make interpretations from their own tests.
6. In groups of two, carry on a six-week nutrient experiment in the school greenhouse which will demonstrate nutrient deficiencies.

EVALUATION:

1. Review notebooks periodically.
2. Evaluate student learning with quizzes.
3. Have student demonstrate laboratory techniques.
4. Evaluate recommendations of students after testing own soils.
5. Check results of project at end of unit with a post-test.

RESOURCES:

1. Contact your local extension office for publications relating to units in the soils area.

2. Invite the area soil conservationist to give a short talk and guided field trip.

3. List of materials:

    A. spurway soil testing kit
    B. pH meter
    C. pails and shovels
    D. ingredients for synthetic soil media
    E. liquid and dry fertilizers
    F. "hozon" and gallon container
    G. samples of different soil types
    H. visuals, slides of nutrient deficiencies, soil profiles, etc.
    I. sampling tube and auger

BIBLIOGRAPHY:

References:

Donahue, Roy L. Soils. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1978

Foster, A. B. Approved Practices in Soil Conservation.

Jones, Fertilizer and Soil Fertility. Reston, Virginia: Reston Publishing Company, 1979.

McCarlin, Judith. Fertilizers and Lime. IMS.

Texts:

McVichar, Using Commercial Fertilizer. Danville, Illinois: Interstate Printers and Publishers, 1978.

Reiley and Shry. Introductory Horticulture, 3rd Edition. Albany, New York: Delmar Publishing Company, 1988.

MEDIA:

Filmstrip:

Fertilizing Ornamental Plants - VEP

Slides:

Nutrient Deficiency, Poinsettias
Nutrient Deficiency, Tomatoes

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PLANT SCIENCE CURRICULUM

UNIT: Plant Propagation

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. develop skills necessary to propagate plants using approved techniques.
2. understand the plant's formation of a new root system.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Greenhouse Foreman	422:2(d, h)
Greenhouse Worker	429:14(g), 429:15(a-h), 430:15(n-ff, kk-qq)
Nursery Worker	446:2(a-f)
Plant Propagator	449:2(a-d), 449:3(a-k), 450:4(a-h)

CONTENT:

I. Sexual (seed propagation)

A. structure and function of seeds
B. production of seeds
C. storage of seeds
D. germination of seeds

1. scarification
2. stratification

II. Asexual

A. significance of cuttings
B. types of cuttings

1. leaf
2. root
3. stem

C. factors affecting success in rooting cuttings
D. procedures in making cuttings
E. care of rooted cuttings
F. grafting - "T" budding; cleft; whip/tongue

G. layering/air-layering

III. Propagation structures

   A. mist system
   B. bottom heat

TEACHER ACTIVITIES:

1. Arrange a field trip to a propagation greenhouse.
2. Demonstrate asexual propagation techniques.

STUDENT ACTIVITIES:

1. Choose correct planting media for different forms of propagation.
2. Make cuttings according to recommended procedures.
3. Store rooted cuttings.
4. Plant rooted cuttings.
5. Make different types of grafts.
6. Perform air layering and layering.
7. Prepare seeds for storage and germination.
8. Sow seed in varying conditions (i.e., light vs. dark).
9. Demonstrate scarification and stratification techniques for difficult to germinate seeds.
10. Log recording propagation and growing information.

EVALUATION:

1. Quizzes on factual knowledge.
2. Observation of techniques used in making cuttings, grafting, budding and layering.
3. Percent of takes on various asexual techniques.
4. Grade for accurate log data.

MATERIALS AND EQUIPMENT:

1. Grafting knife.
2. Grafting tape or rubberbands.
3. Grafting wax.
4. Seed scarification - sand paper, hot water.

BIBLIOGRAPHY:

References:

Hartman and Kester. *Plant Propagation Principles and Practices*. Prentice-Hall.

Hill, Lewis. *Secrets of Plant Propagation*. Garden Way Publishers, 1985.

Nelson, *Commercial Flower Forcing*. McGraw-Hill.

Reilly, Ann. *Park's Success with Seeds*. Geo. Park Seed Inc., 1987.

Plumridge, Jack. *How to Propagate Plants*. Lothian, 1979.

Wright, John. *Propagation: How to Grow Plants Using Seed, Cutting and Other Methods*. Blandford, England: Sterling, 1985.

Periodicals:

Greenhouse Manager
American Nurseryman

Texts:

Reiley and Shry. *Introductory Horticulture, 3rd Edition*. Albany, New York: Delmar Publishing Co., 1988.

Fretz, *Plant Propagation Lab Manual*. Burgess, 1979.

MEDIA:

Filmstrips:

Propagation - Prentice-Hall
Sexual Reproduction of a Plant - Prentice-Hall

INDIVIDUAL TEACHER UNIT REVIEW

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3.

PLANT SCIENCE CURRICULUM

UNIT: Retail Flower Shop Management

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. work at a retail flower shop.
2. exhibit knowledge of stocking, displaying, advertising and marketing practices.
3. perform various accounting and recordkeeping practices.
4. communicate effectively with floral shop customers.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Floriculture Salesperson	417:1(a-e), 417:2(a-h), 418:3(a-h)
Floral Designer	419:1(a-g), 419:2(a-e), 420:3(a-g)
Flower Shop Manager	423:1(a, b), 423:2(a-h), 424:3(a, b), 424:4(a-e)

CONTENT:

I. Employment opportunities

   A. types of positions
   B. local, state and regional employment opportunities

II. Evaluation of potential market for products and services

   A. demographic data
   B. competition

III. Shop lay-out and organization

   A. customer traffic pattern
   B. work area
   C. sales area - permanent display areas, shelving
   D. storage areas

IV. Obtaining supplies

   A. floral supplies
   B. office and other business supplies

V. Management

   A. hiring and training employees
   B. store hours and special sales periods

VI. Marketing flowers and floral materials

   A. advertising and promotion

      1. regular year-round sales and promotion
      2. special holiday promotion

   B. displays and point of purchase promotion
   C. diversification of sales to attract more customers

VII. Accounting, bookkeeping and recordkeeping

   A. financial records to determine profitability
   B. records of sales of different types of items to plan for following year
   C. inventory control

VIII. Communication skills needed in a floral shop

   A. waiting on customers
   B. telephone orders
   C. floral consultation services (weddings, parties, etc.)

IX. Care and handling of floral materials

   A. care of cut flowers when receiving them from wholesaler
   B. packaging customer purchases

TEACHER ACTIVITIES:

1. Use lecture periods to explain the retail florist business.

2. Arrange field trips to local retail and wholesale florists.

3. Provide opportunities for students to practice communication skills and recordkeeping skills.

STUDENT ACTIVITIES:

1. Maintain a notebook of lecture and discussion sessions.
2. Draw the lay-out for a retail florist shop.
3. Evaluate the potential market for a retail florist shop.
4. Design a display advertisement.
5. Make a window display.
6. Design a holiday promotion schedule.
7. Figure wholesale and retail costs for floral shop products and services.
8. Practice accounting and bookkeeping procedures.
9. Practice communication skills using simulation activities.
10. Handle and package floral materials for customers.

EVALUATION:

1. Review notebooks periodically.
2. Evaluate student shop lay-out.
3. Have student critique shops visited.
4. Give written examinations on content.

RESOURCES:

1. Local wholesale and retail florists.
2. Drawing materials.
3. Accounting and recordkeeping materials.

BIBLIOGRAPHY:

Reference:

Garding, Retail Floristry. University of Texas, 1976.

Texts:

Berninger, Louis. *Profitable Garden Center Management*. Reston, Virginia: Reston Publishing Company, 1982.

Retail Floriculture, Book I. Ohio, 1976.

MEDIA:

Filmstrip:

Care and Handling of Cut Flowers and Foliage - VEP

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PLANT SCIENCE CURRICULUM

UNIT: Turf Management

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12, Fall or Spring

OBJECTIVES: The students will be able to:

1. explore employment opportunities in turfgrass occupations.
2. identify the turfgrasses used in Connecticut.
3. maintain proper soil fertility for turf areas.
4. learn mowing and watering practices.
5. identify and control pests of lawns.
6. plan and establish a new turfgrass area.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Grounds Supervisor	432:5(a-k), 433:8(a-g)
Landscape Planter	436:5(a-l)
Grounds Worker	437:1(a-m)
Landscape Worker	440:3(a-i)
Retail Landcape and Garden Center Salesperson	444:6(a-m)
Golf Course Maintenance Worker	445:1(a-c, g, j-m, r, s, w, x), 456:2(c-e, h, i, k), 456:3(f, h), 456:4(a-g)
Maintenance Worker	458:2(a-b, f-h), 458:3(a-i)
Work Foreman	460:3
Golf Course Pesticide Specialist	463:1-3

CONTENT:

I. Exploring employment opportunities

   A. specific job classification
   B. outlook, nature of work, and qualifications needed

II. Identify turfgrasses

   A. parts of grass plant
   B. growth habits and cultural requirements

III. Soil fertility

   A. soil sampling and understanding soil tests
   B. lime requirements
   C. fertilizer recommendations per use, variety, etc.
   D. applying lime and fertilizer

IV. Mowing and watering

   A. mowing height, frequency, and practices
   B. thatch control and aeration
   C. amount of frequency, time and rate of watering
   D. different watering equipment

V. Turf pests

   A. identification of weeds
   B. control of weeds using chemicals
   C. disease identification, causes and control
   D. insect control and identification
   E. types of equipment used to control pests

VI. Establishing turfgrass

   A. time of planting
   B. seedbed preparation
   C. grass seed mixtures
   D. lime, fertilizer, seed, mulch, etc., amounts and types
   E. methods of preparation, and cost estimating

TEACHER ACTIVITIES:

1. Show slides to acquaint students with turf jobs.

2. Plan a field trip to turf farm or golf course.

3. Provide turf plants for identification, and use slides.

4. Demonstrate soil sampling procedures, and discuss the recommendations.

5. Demonstrate lime and fertilizer handling and application.

6. Discuss and demonstrate mowing, watering, and thatch removal equipment.

7. Provide examples of weeds, insects, and disease damage.

8. Demonstrate weed, insect, and disease control practices.

9. Develop a turf establishment contract for students to practice steps in turfgrass establishment.

STUDENT ACTIVITIES:

1. View slides on turf occupations.
2. Take field trip to turf operation, such as golf course.
3. Study slides on turf grass identification.
4. Prepare mounts of different turf grass species.
5. Plant a flat of a turf grass species or variety.
6. Take soil samples of turf area, fill out information sheet, and analyze results of test.
7. Apply lime and fertilizer to turf area.
8. Operate different lawn mowers, and thatch removal equipment.
9. Determine water distribution pattern of different watering devices.
10. Preserve specimens of weeds, insects, and diseases of turf for study and display.
11. Operate turf sprayer equipment at local golf course or on school grounds.
12. Write up a turf establishment contract detailing date of planting, methods to use, amounts of materials, estimate time and cost to complete.
13. Set up a turf test plot at least 50 feet by 50 feet to observe seed mixtures, seeding rates, and fertilizer amounts.

EVALUATION:

1. Turf grass identification quiz.
2. Test ability to calculate, select, and apply lime, fertilizer, seeds, etc.
3. Score section of the turf test plot.
4. Write turf contract for turf management.

RESOURCES:

1. Local golf course.
2. Local tree farm.
3. Seed samples.
4. Trial plots.
5. Turf equipment - lawnmower.
6. Local small engine service shop.

BIBLIOGRAPHY:

References:

Greenskeeping, Pennsylvania State, 1980

Grounds Maintenance, Intertec Publishing Corp., 1988.

Harcourt, Brace. Weeds, Trees, and Turf. Jovanovich Publications.

Petrovic, A. Martin. Picture Clues to Turfgrass Problems. Ithaca, New York: Cornell, Cooperative Extension Publication.

Taylor, Taylor's Guide to Ground Covers, Vines and Grassings. Houghton-Mifflin, Co., 1987.

Turfgrass Maintenance. Establishment, Pennsylvania State, 1980.

Turgeon, Turfgrass Management, Reston, Virginia: Reston Publishing Co., 1980.

Vengris, Jonas. Lawns, Basic Factors, Construction, and Maintenance of Fine Turf Areas. Fresno, California: Thomson Publications.

MEDIA:

Slides:

Lawn Care and Management - Ohio
Lawn Renovation and Reestablishment - Ohio

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PLANT SCIENCE CURRICULUM

UNIT: Vegetable Production and Marketing

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12, Spring

OBJECTIVES: The students will be able to:

1. display a working knowledge of a vegetable production enterprise.
2. identify and describe cultural requirements of common vegetable crops.
3. select a site for a vegetable farm.
4. describe methods of a marketing vegetables.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Vegetable Grower	195:1(a-k), 195:2(a-1), 196:3(a-h)
Retail Landscape and Garden Center Salesperson	444:5(a-m)

CONTENT:

- I. Vegetable Industry
    - A. scope
    - B. production areas - local, regional, national
- II. Classification of vegetables
    - A. botanical families
    - B. warm and cool season crops
    - C. varieties
- III. Seed and seed sowing
    - A. seed identification
    - B. purchasing seed
    - C. sowing seed
- IV. Identification and cultural management for common vegetable crops
- V. Transplanting and growing of vegetables
    - A. growing structures
    - B. transplanting
    - C. hardening-off transplants

VI. Site selection

- A. preparing soil
- B. soil testing and pH
- C. addition of fertilizer and organic matter
- D. determining fertilizer requirements

VII. Field planting

VIII. Cultivation and rotation of crops

- A. weed control
    1. manual
    2. chemical
- B. rotation of crops
- C. conservation practices

IX. Irrigation and mulching

X. Control of insects and diseases

- A. identification of common insects and diseases
- B. pesticide use and safety
- C. integrated pest management

XI. Marketing

- A. quality and grading
- B. harvesting
- C. preparation for market
- D. equipment for harvesting and handling
- E. storage

TEACHER ACTIVITIES:

1. Prepare study guides.

2. Arrange field trips to local market farms.

3. Visit a local wholesale market.

4. Show slides and pictures of common vegetables and insects.

STUDENT ACTIVITIES:

1. Complete cultural information sheet on each common vegetable.

2. Review extension bulletins on popular varieties of vegetables in Connecticut.

3. Individual student project integrated into S.O.E.P.

EVALUATION:

1. Quizzes.
2. Cultural information sheets.
3. Student projects.

RESOURCES:

1. Local farms and nurseries.
2. Extension bulletins.
3. School greenhouse.

BIBLIOGRAPHY:

References:

Crockett, James. Crockett's Victory Garden. Little Brown, Canada, 1978.

National Gardening Association, Gardening. Reading, Massachusetts: Addison-Wesley PUblishing Co., 1985.

Ortho, Ortho's All About Vegetables.

Planning Your Vegetable Garden, Connecticut Extension Bulletin.

Reilly, Ann. Park's Success with Seeds. Greenwood, South Carolina: Geo. W. Park Co., Inc., 1978.

Text:

Reiley and Shry, Introductory Horticulture. Danville, Illinois: Delmar Publishers Inc.

MEDIA:

Filmstrip:

Vegetable Gardening - Photocom

Slides:

Diseases of a Vegetable Garden - University of Illinois

Computer Software:

Ortho's Computerized Gardening - Ortho
The Gardener's Assistant - Shannon

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PLANT SCIENCE CURRICULUM

UNIT: Beekeeping

LENGTH: Six weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11-12

OBJECTIVES: The students will be able to:

1. identify bees.
2. identify and use beekeeping equipment.
3. start a hive.
4. know how and when to feed a hive.
5. remove honey from a hive.
6. be able to identify and know how to treat foul brood.
7. extract honey.
8. prepare a hive for winter.

RELATED JOB TITLES AND RELEVANT COMPETENCIES:

Apiculturalist	139:1(a), 139:3(a, b), 140:5(b), 140:6(a-d), 140:10(a-c), 140:12(a-c)

CONTENT:

I. Set up a hive from a kit
    A. build supers
    B. build frame
    C. add foundations

II. Bee safety
    A. demonstrate and explain proper use of all protective clothing and smoker

III. Starting a hive
    A. purchase a package and queen
    B. disease prevention
    C. feeding

IV. Honey production

   A. remove honey from a hive
   B. extract honey
   C. bottle and sell product

TEACHER ACTIVITIES:

1. Purchase starter hive, protective clothing and extractor.
2. Check with area beekeepers about possible field trips (In Connecticut, Beekeepers register their hives with the Town Clerk at a minimal cost per hive. They are then inspected by the State.).

STUDENT ACTIVITIES:

1. Compile a list of beekeepers in the area.
2. Construct a hive.
3. Install foundations in frames.
4. Work with bees where possible.
5. Read assigned reading.

EVALUATION:

1. Observe students assembling hives.
2. Observe student handling bees.
3. Score tests and quizzes.

RESOURCES:

1. Local beekeepers.
2. Beekeeping Education Service
   P.O. Box 817
   Cheshire, Connecticut 06410-0817
   203-271-0155

BIBLIOGRAPHY:

ABC & XYZ of Bee Culture. Medina, Ohio: The A.I. Root Co.

Beekeeping for Beginners, USDA Bulletin #158

Identification and Control of Honey Bee Diseases, USDA Bulletin #2255

Pesticides and Honey Bees, USDA Bulletin #563

Sammaturo, Diana and Avitabile, Alphonse. The Beekeeper's Handbook. Peach Mountain Press, Ltd., 1981.

Selecting and Operating Commercial Beekeeping Equipment.

Supplemental Feeding of Honey Bee Colonies, USDA Bulletin #413.

MEDIA:

Slides:

Beekeeping Basics, Lessons in Beekeeping - Beekeeping Education Service, Cheshire, Connecticut

Introductory Beekeeping - Beekeeping Education Service, Cheshire, Connecticut

Life Histories of the Honeybee - Cornell, IMS

The Nature of Honeybees - Cornell, IMS

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PLANT SCIENCE CURRICULUM

UNIT: Plant Tissue Culture

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. understand the importance of micropropagation.
2. become acquainted with the value of plant tissue culture in research.
3. become acquainted with the applications of plant tissue culture.

CONTENT:

I. What is plant tissue culture?

   A. clones
   B. rapid mass production
   C. virus free stock

II. Advantages of micropropagation

   A. cost efficient
   B. genetically uniform
   C. disease free
   D. saves time and space
   E. no seasonal requirements

III. Disadvantages of micropropagation

   A. high initial cost
   B. long-range planning
   C. high overhead
   D. contamination

IV. Using the laboratory

   A. mixing and transferring

      1. media preparation
      2. aseptic technique

B. lab organization

    1. wash area for glass
    2. media preparation area
    3. transfer area
    4. incubation area
    5. equipment
    6. observation and experimentation area

V. Stages of micropropagation

    A. Stage 0 - plant preparation
    B. Stage 1 - disinfestation
    C. Stage 2 - multiplication
    D. Stage 3 - rooting
    E. Stage 4 - acclimation

VI. Growth regulators

    A. cytokinins
    B. auxins
    C. gibberellic acid
    D. abscisic acid
    E. ethylene

VII. Applications of plant tissue culture

    A. micropropagation
    B. virus elimination - meristem culture
    C. physiological studies
    D. germplasm preservation
    E. callus culture
    F. suspension culture
    G. anther culture - pollen culture
    H. embryo rescue

VIII. Future research

    A. botanical substance production
    B. somaclonal variation
    C. plant improvement

        1. disease resistance
        2. herbicide tolerance
        3. insect resistance
        4. environmental stress tolerance
        5. increase yield

TEACHER ACTIVITIES:

1. Arrange tissue culture lab trips.
2. Assist student in micropropagation lab project.
3. Order laboratory kit.

STUDENT ACTIVITIES:

1. Visit tissue culture lab.
2. Students will maintain a notebook on lectures and discussions.
3. Students will perform a micropropagation experiment.

EVALUATION:

1. Review student notebooks.
2. Evaluate learning through quizzes.
3. Evaluate micropropagation project.

RESOURCES:

2. Local State Universities.

BIBLIOGRAPHY:

Bottino, P.J. Plant Tissue Culture. Kemtec Educational Corporation, 1981.

Kyte, Lydiane. Plants From Test Tubes. Timber Press, 1983.

Pierk, R.L.M. In vitro Culture of Higher Plants, 3rd Edition. Kluwer Academic, P.O. Box 358, Hingham, Massachusetts 02018, 1987.

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PLANT SCIENCE CURRICULUM

UNIT: Hydroponic Culture

LENGTH: Three weeks. Select areas of content by student needs and time available.

WHEN TAUGHT: Grade 11 or 12

OBJECTIVES: The students will be able to:

1. learn the growing techniques of a hydroponic greenhouse.

2. understand the applications of hydroponic growing.

CONTENT:

I. History and terminology

   A. past
   B. present
   C. future

II. Uses for hydroponics

   A. plant physiology research
   B. crop production

      1. food
      2. ornamentals

III. Plant culture

   A. plant requirements

      1. seeding
      2. temperature
      3. light
      4. CO_2
      5. transplanting
      6. spacing
      7. fertilizing
      8. pollination
      9. diseases and insects

   B. nutrient solutions

      1. inorganic salts
      2. plant requirements
      3. calculations
      4. preparing nutrient solutions
      5. maintenance of solution volume
      6. injector or proportioner system

IV. Hydroponic growing medium

- A. water culture
    1. commercial systems
    2. home units
    3. tube culture
    4. aeroponics
- B. gravel culture and sand culture
    1. media characteristics
    2. sub-irrigation of gravel culture
    3. trickle irrigation
    4. sterilization of media
    5. advantages and disadvantages
- C. sawdust culture
    1. media characteristics
    2. nutrient solution distribution systems
- D. other soilless cultures
    1. peat
    2. vermiculite
    3. perlite
    4. pumice
    5. soilless medium
    6. plastoponics

V. Culture of the plant

- A. seeding
- B. temperature
- C. watering
- D. light
- E. CO_2 enrichment

TEACHER ACTIVITIES:

1. Order chemical fertilizer and supplies.

2. Demonstrate small hydroponic growing system.

3. Field trips.

STUDENT ACTIVITIES:

1. Students help grow plants using a hydroponic system.
2. Students observe and record plant growth.
3. Students will maintain a notebook.

EVALUATION:

1. Review student notebooks.
2. Evaluate learning through quizzes.
3. Evaluate student's work with hydroponic system.

BIBLIOGRAPHY:

References:

Cooper, Allen. The ABC of NFT, Nutrient Film Technique. London: Grower Books, 1979.

Cooperative Extension Service Bulleting, University of Illinois. An Incomplete List of Greenhouse Vegetable Publications.

Whiting, Albert. Lettuce from Eden, Hydroponic Growing Systems for Small and Large Greenhouses. Mildmay, Ontario: The Town Crier, 1980.

Texts:

Bentley, Maxwell, Ph.D. Hydroponics Plus. O'Connor Printers, May, 1974.

Harris, Dudley. Hydroponics: Growing Plants Without Soil. Purnell and Sons, 1974.

Resh, Howard M. Hydroponic Food Production, 3rd Edition. Santa Barbara, California: Woodbridge Press Publishing Company, 1985.

Sherman, Charles E. and Hap Brenizer. Hydroponic Gardening at Home. Nolo Press, 1975.

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APICULTURIST

Other Titles: Beekeeper, Honey Producer, Honey Farmer.

Job Description:

The occupation of Apiculturist involves a wide range of activities in the management and operation of bee colonies. The size of the operation varies considerably. The duties may include preparing hives, providing suitable flowering plants, maintaining bees during winter, operating equipment to handle bees, feeding bees, controlling diseases and pests, harvesting honey, processing, and marketing honey and beeswax.

Competencies Identified and Validated

N = 41*

Competencies		Weighted Mean**
1.	Establish apiary facilities.	3.0
a.	Select site for hives.	3.5
b.	Assemble bought hives.	2.7
c.	Construct hives.	2.5
d.	Plan arrangement of hives.	2.4
2.	Provide suitable plants.	2.8
a.	Study availability of plants producing pollen and nectar.	3.5
b.	Identify desirable plants.	3.1
c.	Select desirable plants.	2.9
d.	Establish desirable plants.	1.7
3.	Provide seasonal management.	3.3
a.	Provide food supply in winter.	3.4
b.	Maintain strength of hives in fall.	3.3
c.	Prevent swarming in spring.	3.3
d.	Encourage spring honey production.	3.2
4.	Establish a bee farm.	3.0
a.	Obtain necessary equipment and facilities.	3.5
b.	Secure needed financing.	3.5
c.	Budget financial resources.	3.4
d.	Select honey bee stocks.	3.0
e.	Determine availability of market for honey, bees wax, and bees.	2.9

---

* Responses from 41 Apiculturists in six states. Survey conducted by Department of Agricultural and Extension Education, Mississippi State University, Mississippi State, Mississippi 39762.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

	f.	Employ needed labor.	2.8
	g.	Submit required government reports.	2.5
	h.	Determine if persons are allergic to bee stings.	2.5
5.		Understand bee biology and behavior.	2.5
	a.	Understand effect of weather on bee behavior.	3.1
	b.	Understand the bee's social organization.	3.0
	c.	Identify different species or types of bees.	2.2
	d.	Identify external parts of bee.	2.0
6.		Feed bees.	2.8
	a.	Understand importance of artificial feed.	2.9
	b.	Select feed to use.	2.9
	c.	Determine amount of feed.	2.8
	d.	Select method of feeding.	2.7
7.		Operate equipment.	3.0
	a.	Use extractor and other honey processing equipment.	3.3
	b.	Operate smoker.	3.3
	c.	Use hive tools.	3.2
	d.	Use bee veils.	3.2
	e.	Use bee gloves.	2.1
8.		Control disease, parasites, and other pests.	3.5
	a.	Determine symptoms.	3.8
	b.	Diagnose problem.	3.7
	c.	Select treatment or prevention program.	3.6
	d.	Prevent death or injury due to use of pesticide in vicinity.	3.3
	e.	Calculate chemicals or drugs.	3.3
	f.	Administer chemicals or drugs.	3.1
9.		Control pests.	3.1
	a.	Control waxworm.	3.3
	b.	Control mice.	2.9
10.		Manage brood.	3.0
	a.	Replace inferior queen.	3.6
	b.	Recognize inferior queen.	3.5
	c.	Improve stocker bees.	2.8
	d.	Limit drone activity.	2.0
11.		Harvest honey.	3.1
	a.	Determine amount of honey to leave for bees.	3.5
	b.	Select time to remove honey.	3.0
	c.	Remove frames of honey.	2.7
12.		Process honey.	2.8
	a.	Extract honey.	3.4
	b.	Uncap honey.	3.1

c.	Strain honey.	2.8
d.	Package honey.	2.7
e.	Check honey flavor.	2.6
f.	Determine honey color.	2.4
g.	Heat honey.	2.3
13.	Market honey and bees wax.	2.2
a.	Secure wholesale or bulk markets.	2.8
b.	Grade honey.	2.6
c.	Establish selling prices.	2.3
d.	Establish retail outlet.	2.1
e.	Haul honey.	2.0
f.	Prepare advertisement for honey.	1.9
g.	Operate a roadside honey stand or store.	1.4

MUSHROOM GROWER

Other Titles: Mushroom Producer, Mushroom Farmer, Mushroom Worker, Mushroom Cultural Expert, Mushroom Supervisor, Mushroom Farm Manager, Mushroom Technician, Mushroom Coordinator, Mushroom Production Supervisor.

Job Description:

Secures optimum environment of temperature and moisture for growing mushrooms; manages wharf area for preparing compost; provides compost; fills beds in house with compost; pasteurizes compost; secures spawn and spawns beds; cases beds after spawn run; cares for the growing crop; picks the crop; markets crop; cleans out and cleans up house in preparation for growing next crop; helps keep financial records of the business. Often supervises other workers. Keeps up-to-date by reading industry publications and attending industrial seminars and short courses. Is employed by the owner of the business.

Competencies Identified and Validated

N = 51*

	Competencies	Weighted Mean**
1.	Secure optimum environment for growing mushrooms.	3.7
a.	Know optimum temperature and moisture requirements for mushroom production at all stages of the crop.	3.9
b.	Control ventilation and moisture equipment to secure optimum conditions for growing mushrooms.	3.7
c.	Understand the use and capacity of ventilation equipment.	3.6
d.	Take emergency action due to equipment or power failures to prevent loss of the crop.	3.4
e.	Have knowledge of air flows.#	
f.	Improvise if needed.#	
2.	Provide good composting wharf conditions.	2.8
a.	Control compost drainage runoff.	2.9
b.	Keep wharf area free from weeds and the collection of rubbish.	2.8
c.	Prevent and control rats and mice in wharf area.	2.7

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* Responses from 51 Mushroom Growers in 14 states. Survey conducted by Department of Agricultural Education, The Pennsylvania State University, University Park, Pennsylvania 16802.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

Not included on questionnaire but recommended by some experts surveyed.

3.	Provide compost.	3.6
a.	Recognize properly prepared compost for filling beds and trays.	3.8
b.	Turn the compost as needed, for aeration.	3.7
c.	Understand reasons for composting.	3.7
d.	Recognize the need for different turning cycles for various types of composting materials and weather conditions.	3.6
e.	Know and provide the proper moisture requirements in the composting process.	3.6
f.	Provide optimum amount of nitrogen in compost by adding nitrogen supplement if needed.	3.6
g.	Recognize the quality requirements of basic ingredients used in composting.	3.5
h.	Prepare compost from horse manure or synthetic materials, gypsum, and other additives.	3.5
i.	Recognize anaerobic bacterial action in both the pile and the pit water.	3.5
4.	Fill the beds or trays with compost.	3.5
a.	Recognize the need for more or less moisture in the compost at filling for long or short compost and take corrective action.	3.8
b.	Clean and disinfect house for filling.	3.5
c.	Fill beds or trays level full and of uniform density with compost.	3.2
5.	Provide proper curing of compost by cookout.	3.7
a.	Know the purpose of the cookout procedure.	3.8
b.	Be able to determine the absence of free ammonia at the end of cookout.	3.8
c.	Know when there is adequate oxygen.	3.7
d.	Recognize the need for a thorough air kill.	3.7
e.	Determine the best cookout procedure for a particular house and follow that procedure.	3.5
6.	Prepare for spawning the compost beds.	3.2
a.	Know that pre-spawn preparation is the most critical time during the entire cycle, that recontamination must be prevented.	3.8
b.	Test for the presence of free ammonia.	3.5
c.	Have the knowledge and skill to properly use the insect fogger.	2.9
d.	Paint wood surfaces with insecticide to aid in fly control and install electric fly traps.	2.5

e.	Prepare a fly control program for entire growth period. #	
7.	Spawn the compost beds.	3.2
a.	Understand and practice good sanitation procedures during the spawning process.	3.8
b.	Know and provide optimum bed moisture requirements during spawning and the spawn run.	3.7
c.	Provide optimum temperature continuously during spawn run.	3.5
d.	Apply appropriate insecticides during spawn run.	3.5
e.	Know the best method of spawning for your facilities.	3.3
f.	Select the spawn which will produce the best crop yields for your market.	3.2
g.	Determine when spawn run is complete.	3.1
h.	Prepare the optimum bed surface shape for the facilities.	3.0
i.	Provide optimum spawning rate for the mushroom production operation considering price of spawn.	2.7
j.	Provide plastic cover for spawned beds and trays.	2.2
8.	Case the spawned beds or trays.	3.5
a.	Water casing layer using best techniques, to provide optimum moisture content.	3.8
b.	Be alert to potential disease and fly problems.	3.7
c.	Pasteurize casing materials.	3.7
d.	Understand the reasons for casing.	3.6
e.	Know optimum temperature and CO_2 requirements after casing.	3.6
f.	Apply casing materials using optimum amounts.	3.5
g.	Follow the most desirable procedures in preparing materials for casing.	3.4
h.	Know the casing materials that may be used and the advantages and disadvantages of each.	3.3
i.	Store pasteurized casing materials following sanitary practices.	3.3
9.	Grow the mushroom crop.	3.6
a.	Provide optimum temperature, humidity, and fresh air to the growing crop.	3.7
b.	Provide maximum cleanliness throughout house during crop growing period including the removal of dead mushroom tissue, diseased or blemished mushrooms.	3.5

# Not included on questionnaire but recommended by some experts surveyed.

c.	Provide maximum disease and fly control to the growing crop by the use of appropriate insecticides, fungicides, and bacteriacides.	3.6
d.	Know when to water, how much, and where; understand the meaning of some beds drying, others not. #	
10.	Harvest and market the crop.	2.9
a.	Pick or harvest mushroom crop at optimum stage of maturity desired by the market.	3.4
b.	In picking, select "tight" mushrooms and avoid damage by handling.	3.0
c.	Ship the crop as soon as possible after picking or store the crop until marketed in a cool environment.	2.8
d.	Recognize when it is uneconomical to continue cropping.	2.7
e.	Know the most convenient and profitable marketing outlets for the crop.	2.5
11.	Clean-out and clean-up the house.	3.3
a.	Eradicate all diseases and insects within the house before clean-out.	3.4
b.	Follow the most efficient practices (for the facilities) in clean-out and disposal.	3.2
c.	Clean-up and repair the empty house for next filling.	3.2
12.	Supervise workers.	3.1
a.	Develop harmonious relationships with workers.	3.2
b.	Train workers for various jobs.	3.1
c.	Suggest to workers improvements of methods of accomplishing work.	3.1
d.	Observe employee compliance to safety regulations.	3.1
e.	Assist in planning work schedules of employees.	3.0
f.	Judge prospective employee qualifications.	2.9
g.	Is competent in explaining to subordinates the meaning of environment and relationship to mushrooms. #	

# Not included on questionnaire but recommended by some experts surveyed.

NUT PRODUCER

Job Description:

Nut Producers are persons who establish and/or manage a grove of nut producing trees. They apply the cultural practices necessary to produce quality nuts. They also are responsible for harvesting, storing, and marketing the nuts.

Competencies Identified and Validated

N = 31*

Competencies	Weighted Mean**
1. Provide financing.	3.3
2. Establish grove.	3.2
a. Determine varieties suitable for area.	3.6
b. Select site for grove.	3.4
c. Determine spacing for trees.	3.4
d. Prune and train young trees.	3.4
e. Water young trees during dry periods.	3.4
f. Procure young trees.	3.2
g. Transplant trees.	3.2
h. Bud or graft seedlings.	2.8
3. Maintain soil fertility.	3.7
a. Apply needed nutrients.	3.6
b. Recognize deficiency symptoms.	3.4
c. Take soil samples.	3.3
d. Manage soil to prevent erosion.	3.2
e. Collect leaf sample for analysis.	3.1
4. Maintain trees and grounds area.	3.5
a. Control weeds by mowing and/or using chemicals.	3.4
b. Prune trees as needed.	3.2
c. Remove limbs from area.	3.0
5. Control pests.	3.7
a. Apply needed control measures.	3.8
b. Recognize disease symptoms.	3.7
c. Apply needed control measures.	3.7
d. Practice safety in using chemicals.	3.6
e. Recognize insect pests.	3.6
f. Control predators.	3.3

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* Responses from 31 Nut Producers in 7 states. Survey conducted by Department of Agricultural Education, University of Georgia, Athens, Georgia 30602.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some importance; 1.0 = Not Important; 0 = Does Not Apply.

6.		Harvest nuts.	3.7
	a.	Determine best method of harvesting.	3.4
	b.	Determine maturity of nuts.	3.1
7.		Clean nuts.	3.0
8.		Store nuts.	2.8
9.		Market nuts.	3.6
	a.	Locate suitable market for nuts.	3.6
	b.	Transport nuts to market.	2.7
10.		Keep records.	3.5
11.		Operate equipment and machinery.	3.5
	a.	Adjust equipment for maximum efficiency.	3.6
	b.	Recognize malfunction in equipment.	3.5
	c.	Service machinery and equipment according to operator's manual.	3.3
	d.	Use safety standards relating to the operation of a particular piece of equipment.	3.2
	e.	Prepare equipment and machinery for storage.	3.2
12.		Participate in local, state and national organizations and meetings relevant to nut production.	3.3
13.		Adjust production techniques based on latest research findings.	3.3

POTATO PRODUCER

Other Titles: Commercial Potato Production Worker,
Potato Grower, Potato Farmer.

Job Description:

The experience commercial Potato Production Worker selects the land, prepares it for planting, determines soil nutrient requirements, plans a fertility program, and applies fertilizers, determines soil moisture requirements, plans and applies an irrigation program; evaluates, selects, and prepares seed potatoes; determines time and methods of planting, plants the crop, evaluates weed control methods; and plans and applies a weed control program; determines degree of insect threat, compares control methods, plans and applies an insect control program, recognizes disease symptoms, evaluates control methods, and plans and applies a disease control program; selects harvesting and storage methods, determines time to harvest, and operates harvest and storage equipment; evaluates market news, marketing systems, and buyer-seller contracts; sells potato crop, calculates profits, and analyzes future production; operates and maintains the machinery and equipment, and maintains the buildings and structures.

Competencies Identified and Validated

N = 55*

Competencies	Weighted Mean**
1. Understanding the potato industry.	1.5
a. Evaluate opportunities in potato production.	2.0
b. Explain the economic importance of the potato industry as it relates to the public, the state, the nation, and the world.	1.7
c. Describe government policies that effect potato production.	1.5
d. Discuss the history of potato production.	1.3
e. List the amount of potato production in the United States and the world.	1.3
2. Selecting and preparing the soil.	2.7
a. Operate tillage equipment and power sources safely.	3.5
b. Perform field adjustments and minor field repairs on equipment and power sources used in the plowing operation.	3.5

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* Responses from 55 Potato Producers in 10 states. Survey conducted by Department of Agricultural Education, University of Idaho, Moscow, Idaho 83843.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

c.	Compare methods of seedbed preparation.	2.7
d.	Develop a good system of crop rotation for soil building and soil sanitation.	2.4
e.	Recognize land possessing the physical conditions, native fertility, and gross topography suitable for potato production.	2.2
f.	Determine seasonal availability of water required for potato production.	2.2
g.	Evaluate advantages and disadvantages of spring and fall plowing and select proper method for local situations.	2.2
3.	Selecting, obtaining, and preparing seed potatoes.	2.6
a.	Operate seed cutting machinery safely.	3.5
b.	Perform adjustments and minor repairs on seed cutting equipment.	3.3
c.	Understand the purposes and methods of potato seed treatment.	2.8
d.	Prepare seed pieces of desirable size and number of eyes per piece.	2.8
e.	Determine amount of potato seed required.	2.4
f.	Compare the advantages and disadvantages of certified and non-certified or home-saved seed potatoes.	2.3
g.	Explain storage methods and requirements of seed potatoes.	2.3
h.	Identify and select varieties best suited for local conditions.	2.2
i.	Select potato varieties according to utilization (chips, fries, etc.).	2.0
j.	Evaluate the effect of potato seed varieties on yield responses.	1.9
4.	Establishing potato crops.	2.9
a.	Perform field adjustments and minor field repairs on planting equipment and power sources.	3.6
b.	Operate planting equipment and power sources safely.	3.6
c.	Calibrate and adjust planters for rate and depth of planting.	3.4
d.	Care for potato seed pieces before planting.	3.3
e.	Determine depth of planting.	3.0
f.	Determine rate of planting.	2.9
g.	Determine soil and moisture conditions necessary for planting.	2.6
h.	Study local weather conditions at time of planting.	1.9
i.	Recognize seasonal weather variations to estimate planting time for optimal growing conditions.	1.9

5.	Selecting and implementing irrigation methods.	2.2
a.	Operate irrigation equipment safely.	3.2
b.	Perform field adjustments and minor field repairs on irrigation equipment and power sources.	3.0
c.	Set up irrigation equipment.	2.9
d.	Identify soil and plant conditions indicating irrigation needs.	2.6
e.	Measure and control water distribution.	2.5
f.	Evaluate the effects of moisture on quantity and quality of potato crop.	2.4
g.	Determine irrigation schedules for greatest economic gains.	2.3
h.	Evaluate economic importance of recommended irrigation practices.	1.9
i.	Evaluate various irrigation methods and systems.	1.9
j.	Determine added costs and returns from proper irrigation.	1.9
k.	Determine the type and slope of soil.	1.8
l.	Determine available water supply.	1.7
m.	Determine cost of installation and cost of operating an irrigation system.	1.6
n.	Select an irrigation system according to needs and costs.	1.6
o.	Interpret federal and state laws relating to water rights and uses.	1.6
6.	Selecting and using fertilizers and soil conditioners.	2.3
a.	Perform field adjustments and minor field repairs on fertilizer equipment and power sources.	3.5
b.	Operate fertilizer application equipment and power sources safely.	3.4
c.	Calibrate fertilizer application equipment.	3.1
d.	Take soil samples.	2.2
e.	Identify nutrient deficiency symptoms in growing plants.	2.2
f.	Evaluate the effect of fertilizer use on yield responses.	2.2
g.	Identify nutrient requirements in potato production.	2.0
h.	Interpret and use soil test results.	2.0
i.	Determine when to apply fertilizers and soil conditioners.	2.0
j.	Determine amount of fertilizer and soil conditioners to apply.	1.9
k.	Compare cost per unit of nutrient from available fertilizer sources.	1.8

l.	Determine the most economic combination of potato nutrient sources.	1.7
m.	Compare costs of fertilizer application methods.	1.7
7.	Controlling weeds.	2.8
a.	Apply weed control chemicals correctly and safely.	3.5
b.	Operate mechanical weed control equipment, herbicide application, equipment, and power sources safely.	3.5
c.	Perform field adjustments and minor field repairs on weed control equipment and power sources.	3.5
d.	Read and comply with manufacturer's label directions and legal requirements affecting recommended herbicide application, timing, and safety.	3.4
e.	Calibrate herbicide application equipment.	3.4
f.	Store, mix, and handle herbicides conforming to manufacturer's label directions.	3.3
g.	Meet state requirements for herbicide use.	3.1
h.	Recognize dangers of carry-over of herbicide residues in the soil and in application equipment.	3.0
i.	Evaluate the influence cultivation has on yields, soil temperature, and soil moisture.	2.3
j.	Identify common weeds.	2.3
k.	Recognize weed infestation problems and select the best method of control.	2.2
l.	Appraise the performance of recommended herbicides.	2.2
m.	Evaluate economic impact of weeds on potato crop.	2.2
n.	Identify the methods with which weeds spread.	1.9
8.	Controlling insects.	2.8
a.	Operate insect control equipment and power sources safely.	3.5
b.	Perform field adjustments and minor field repairs on insect control equipment and power sources.	3.4
c.	Calibrate insecticide application equipment.	3.3
d.	Identify dangers of insecticide residue carry-over in application equipment.	3.3
e.	Read and comply with manufacturer's label directions and legal requirements affecting recommended insecticide application, timing, and safety.	3.3
f.	Store, mix, and handle recommended potato insecticides conforming to manufacturer's label directions.	3.3

g. Detect insect infestation. 2.9
h. Meet state requirements for use of E.P.A. designated "Restricted Pesticide". 2.8
i. Identify and evaluate damage caused by insects to potato crop. 2.5
j. Identify and distinguish between harmful and beneficial potato crop insects. 2.5
k. Appraise performance of recommended insecticides. 2.3
l. Select the best insect control program in terms of economic costs, returns, and environmental impact. 2.2
m. Evaluate life cycle of insects to determine appropriate control procedures. 2.2
n. Identify methods by which insects are spread. 2.1

9. Controlling diseases. 2.8

a. Operate disease control equipment and power sources safely. 3.4
b. Perform field adjustments and minor field repairs on disease control equipment and power sources. 3.4
c. Calibrate disease control applicators correctly. 3.3
d. Clean and disinfect all potato equipment and storage facilities with live steam or chemicals to control potato diseases. 3.3
e. Read and comply with manufacturer's label directions and legal requirements affecting recommended fungicide application, timing, and safety. 3.2
f. Interpret and follow chemical label directions for fungicide storing, mixing, and handling. 3.1
g. Identify dangers of chemical carry-over of fungicide residues in soil and application equipment. 3.0
h. Meet state requirements for fungicide use. 2.9
i. Identify potato diseases and interpret their effect on potato crops. 2.6
j. Identify and appraise the performance of recommended fungicides. 2.0
k. Identify the methods by which diseases are spread. 2.0
l. Evalute environmental impact of disease control programs. 1.9
m. Select a recommended disease control program in terms of expected costs and returns. 1.8

10.	Harvesting potato crop.	2.6
a.	Operate potato harvest equipment and power sources safely.	3.5
b.	Determine correct field travel and PTO speed for harvesting operation.	3.5
c.	Perform field adjustments and minor field repairs on harvest equipment.	3.4
d.	Identify weather and soil conditions essential for maximum harvest efficiency and minimum bruising and injury.	2.6
e.	Determine potato crop maturity.	2.5
f.	List and evaluate vine-killing methods to hasten potato maturity.	2.1
g.	Evaluate weather conditions and forecasts in local area.	2.0
h.	Compare and evaluate available potato harvest equipment for local needs.	2.0
i.	Calculate expected costs and returns of custom versus farm-owned harvest equipment.	1.5
11.	Storing and handling potato crop.	2.9
a.	Operate potato handling equipment safely.	3.7
b.	Adjust, maintain, and repair potato handling equipment.	3.5
c.	Identify proper filling and removal practices to reduce potato damage.	3.3
d.	Evaluate economic impact of careless potato crop handling.	3.2
e.	Provide and maintain proper storage temperature, humidity, and air circulation to minimize economic loss depending on intended use of crop (seed, fresh, processing).	3.1
f.	Compare and evaluate available storage facilities.	2.1
g.	Evaluate washing, grading, and packing methods in relation to costs and returns.	1.8
12.	Marketing potato crop.	1.7
a.	Inspect potatoes for damages and defects.	2.9
b.	Identify various grades of potatoes.	2.6
c.	Calculate expected returns and profits from sales.	1.6
d.	Select appropriate marketing system.	1.5
e.	Select carriers to ship potatoes.	1.4
f.	Interpret payment terms and other contract agreements.	1.4
g.	Negotiate buyer-seller contracts.	1.4
h.	Interpret production statistics and market reports.	1.4

i.	Determine feasibility of participating in potato futures market and contracts.	1.3
j.	Analyze market cycles.	1.3
13.	Analyzing production.	1.6
a.	Evaluate the role of potato production in the local farming program.	1.8
b.	Summarize and evaluate yearly production records.	1.7
c.	Calculate anticipated profits from future production.	1.6
d.	Evaluate future seasonal and yearly production and demand forecasts.	1.5
14.	Maintaining equipment and power sources.	2.9
a.	Perform proper maintenance and servicing of machinery according to operator's manual.	3.5
b.	Inspect equipment for potential breakdowns and safety hazards.	3.4
c.	Prepare equipment for storage and removal from storage.	3.2
d.	Perform major repairs on equipment and power sources (i.e., replace universal joints, replace bearings and seals, etc.).	3.1
e.	Maintain records of maintenance and repair of machinery and equipment.	2.8
f.	Maintain a daily log of number of hours each piece of equipment is used.	2.4
g.	Compare and select equipment and power sources best suited for local operation.	2.2

SMALL FRUIT FARMING

Other Titles: Berry Grower, Fruit Farmer, Fruit-Farm Manager, Commercial Producer of Blueberries, Grapes, Raspberries, and/or Strawberries, Blueberry Grower, Raspberry Grower, Strawberry Grower, Vine Grower, Vineyard Manager, Fruit Gardner.

Job Description:

A commercial producer of small fruit is a person competent in managerial and technical skills needed to carry out timely approved practices resulting in maximum profit from the small-fruit enterprises. These skills are needed by owners, managers, and operators. The broad competency areas needed by small fruit producers are as follows: Planning for Production, including acquiring technical knowledge, managing finances, site and variety selection, and site preparation; Growing Small Fruit Crops, including, soil preparation, propagation and planting, fertilization, pest control, machinery selection and maintenance; Harvesting, Processing, Storing and Marketing Small-Fruit Crops, including those operations involved in commercial marketing or operating a pick-your-own outlet.

Competencies Identified and Validated

Competencies	Weighted Means by Occupation** Blueberries N = 40	Grapes N = 69	Raspberries N = 34	Strawberries N = 33
1. Plan to grow small-fruit crops.	3.1	3.2	3.2	3.1
a. Select proven, disease resistant, locally adapted, high-producing varieties of plants which are suitable for the chosen markets.	3.5	3.4	3.8	3.9
b. Select appropriate site for the small-fruit planting.	3.7	3.6	3.6	3.6

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* Responses from Commercial Producers of Fruit in 18 states. Survey conducted by Department of Vocational Education, University of Kentucky, Lexington, Kentucky 40506.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

Competencies	Blueberries	Grapes	Raspberries	Strawberries
c. Realize shortcomings and work to overcome them through study and consultation with experts.	3.0	3.7	3.1	3.4
d. Determine costs in establishing and operating the small-fruit planting.	3.2	3.5	3.3	3.4
e. Lay out the planting plan.	3.0	3.0	3.2	3.2
f. Upgrade knowledge of fruit production through trade journals, technical meetings, grower association, etc.	2.7	2.9	3.0	3.1
g. Prepare the site for long-term utilization in small fruit (grading terracing, installing tile, or draining).	3.2	3.4	3.4	3.1
h. Calculate profit potential in establishing the small-fruit enterprise.	3.1	3.5	3.5	3.1
i. Understand supply and demand aspects of small fruit production.	2.8	3.0	3.1	3.1
j. Analyze personal characteristics, education, and background in small-fruit production.	2.5	2.4	2.6	2.6
2. Grow small-fruit crops.	3.0	2.9	3.1	3.0
a. Mix and apply chemicals properly.	3.5	3.6	3.8	3.8
b. Provide strict safety and control of pesticides and other chemicals used in the operation.	3.4	3.4	3.7	3.6
c. Prepare soil for planting (cultivation, acidification, fertilization).	3.4	3.4	3.7	3.6
d. Plant or transplant the stock properly.	3.0	3.4	3.7	3.6
e. Control unwanted vegetation, with herbicides.	3.0	2.6	3.2	3.6

Competencies	Blueberries	Grapes	Raspberries	Strawberries
f. Control insect pests and related organisms on the small-fruit planting.	3.5	3.6	3.7	3.6
g. Control diseases in the small-fruit planting.	3.5	3.6	3.7	3.6
h. Secure planting stock.	3.4	3.6	3.7	3.5
i. Cultivate the small-fruit planting.	2.5	3.0	3.2	3.4
j. Give extra care to developing plants.	2.9	3.2	3.3	3.3
k. Prepare stock for planting.	2.4	3.5	3.2	2.9
l. Repair, maintain, and replace machinery and equipment used in fruit production.	3.0	3.2	3.0	2.9
m. Control bird and animal pests.	3.2	2.9	2.7	2.7
n. Maintain proper soil reaction through acidification or liming.	2.9	2.5	2.8	2.7
o. Train the plants for ease of handling and optimum production.	2.7	3.3	2.8	2.5
3. Harvest, process, store, and market the small-fruit crop.	2.5	2.3	2.7	2.6
a. Secure adequate picking containers.	3.1	3.0	3.0	3.5
b. Supervise the pickers for careful handling of the crop.	3.1	2.8	3.6	3.5
c. Plan for proper timing of harvest to catch blueberries at their prime stage of ripeness.	3.3	3.4	3.6	3.4
d. Provide shelter for newly picked fruit.	3.0	2.2	3.1	3.1
e. Secure qualified pickers in sufficient numbers per acre.	2.7	2.7	3.4	3.0
f. Pack containers to proper fullness.	2.7	2.1	2.7	3.0

Competencies	Blueberries	Grapes	Raspberries	Strawberries
g. Arrange cool storage of the fruit.	2.5	2.0	2.8	2.2
h. Adjust harvesting equipment for minimum damage to the fruit.	2.8	3.2	2.4	2.0
i. Process small fruit for market.	2.5	1.7	1.8	1.7
j. Arrange for refrigerated shipping to distant markets.	2.6	1.9	2.2	1.7
4. Operate a pick-your-own (customer picks) outlet.	2.5	2.1	2.8	2.9
a. Provide field supervision of picking.	3.0	2.2	3.4	3.5
b. Provide supporting facilities such as roads, parking, playground, restrooms, drinking fountains, convenient scales, and check out, etc.	2.6	1.9	3.2	3.3
c. Plan for staggered ripening of small berries.	3.0	2.1	2.8	3.0
d. Provide containers.	2.6	2.1	2.8	2.9

SOYBEAN PRODUCERS

Other Titles: Farmer, Cash Grain Grower, Grain Farmer.

Job Description:

Plants, cultivates, and harvests soybeans for cash sales. Selects and buys type and amount of seed to be grown, taking into consideration local growing conditions and market demands. Operates equipment to plow, disk, harrow, and fertilize ground for planting, and to plant grain. Plans harvesting, considering ripeness and maturity of grain and weather conditions and operates soybean-harvesting equipment. Sells soybeans or stores them for future sales.

Competencies Identified and Validated

N = 31*

Competencies	Weighted Mean**
1. Opportunities.	2.5
a. Recognize the advantages and disadvantages of soybean production.	2.9
b. Interpret the trends in soybean production.	2.8
c. Identify the special commercial and industrial uses of soybeans.	2.6
d. Recognize the importance of soybeans in daily living.	2.3
e. Identify the occupational opportunities related to soybean production.	2.2
2. Seed selection.	2.9
a. Calculate the number of bushels of soybean seed that would be needed to plant a certain number of acres.	3.5
b. Select the desired soybean varieties to plant considering maturity, disease resistance, lodging resistance, row spacing, and yield level.	3.4
c. Read and evaluate the tag on a bag of soybean seed.	3.3
d. Adjust the recommended seeding rate for soybeans to allow for differences in purity, germination, seed size and row width.	3.3
e. Determine the days of maturity of different soybean varieties and select those varieties that would be adapted to the local community.	3.3

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* Responses from 31 Soybean Producers representing states in the principle soybean producing area of the United States. Survey conducted by the Department of Agricultural Education, University of Nebraska, Lincoln, Nebraska 68583.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

	f.	Explain the purpose and procedure in inoculating soybean seed.	2.8
	g.	Describe why one variety matures earlier than another.	2.3
	h.	Distinguish between determinate and indeterminate types of soybean plants.	2.2
	i.	Identify the parts of the soybean seed and explain the functions of each part.	1.8
3.		Seedbed preparation.	2.9
	a.	Prepare a good seedbed for soybeans.	3.2
	b.	Compare the cost of various tillage systems.	3.1
	c.	Identify the characteristics of a good seedbed.	2.9
	d.	Discuss the tillage practices used to prepare a good soybean seedbed.	2.9
	e.	Compare the relative advantages of using minimum tillage and conventional tillage systems in soybean production.	2.7
	f.	Identify and evaluate the various tillage equipment needed to produce a soybean crop.	2.5
4.		Planting methods and practices.	2.9
	a.	Calibrate planting equipment to get the desired planting rate.	3.2
	b.	Evaluate the most recent findings pertaining to time of planting, depth of planting, width of rows, spacing within the rows, and method of planting.	3.1
	c.	Correctly plant soybeans for specific crop.	3.0
	d.	Estimate the number of acres required to pay the cost of changing to narrow row equipment.	2.8
	e.	Identify the types of planting equipment.	2.7
	f.	Explain the advantages and disadvantages of planting soybeans in narrow rows.	2.6
5.		Fertilizers - rates and application.	2.8
	a.	Calculate the rates of fertilizer to apply to get the maximum return per fertilizer dollar invested.	3.1
	b.	Recognize the importance of proper fertilizer placement for soybeans.	3.0
	c.	Plan a fertilizer program for a specific soybean enterprise.	3.0
	d.	Determine where in the cropping system the recommended fertilizer should be applied.	2.9
	e.	Apply fertilizer to soybean enterprise.	2.9
	f.	Identify nutrient deficiency symptoms in soybeans.	2.8
	g.	Recognize the different methods of applying fertilizer to soybeans.	2.7

h.	Determine the optimum pH range for soybean production.	2.6
i.	Describe the importance of the major nutrients, secondary nutrients, and micro-nutrients in the production of soybeans.	2.6
j.	Evaluate plant analysis methods of determining nutrient needs.	2.5
6.	Pests - weeds, insects, and diseases.	3.1
a.	Identify the pests that are of major concern in the production of soybeans in the community.	3.4
b.	Calibrate pesticide applicators.	3.4
c.	Recognize the pesticides being used to control soybean pests; forms, rates, methods of application, effectiveness, costs, and dangers.	3.2
d.	Summarize the precautions which should be followed when using pesticides.	3.2
e.	Identify pest and pesticide damage in soybeans.	3.2
f.	Control pests of soybeans on home farm.	3.1
g.	Recognize the importance of crop rotation.	2.8
h.	Describe the practices being used in the community to control soybean pests and evaluate their effectiveness.	2.8
i.	Compare cultural controls to chemical controls of soybean pests.	2.7
7.	Harvesting and storing.	2.8
a.	Make the necessary adjustments on soybean harvesting equipment for efficient operation.	3.3
b.	Harvest beans with less than one bushel per acre field loss.	3.1
c.	Determine the major sources of soybean harvesting loss, the percentage loss from each source, and the procedure in minimizing each type of loss.	3.0
d.	Obtain a sample of soybeans, determine whether it is ready for harvesting.	3.0
e.	Determine whether it is more economical to own harvesting equipment for soybeans or to hire a custom operator.	2.8
f.	Calibrate the costs of storing soybeans and determine whether it is advantageous to store.	2.8
g.	Select a harvesting and storage system for soybeans based on efficiency and economy.	2.8
h.	Identify materials and methods used in cleaning and fumigating storage structures.	2.6

	i.	Treat stored soybeans for pest control.	2.5
	j.	Calculate the volume of a structure needed to store a specified number of bushels of soybeans.	2.3
8.	Marketing.		2.6
	a.	Market soybeans to best economic advantage.	3.3
	b.	Locate market outlets for soybeans.	2.8
	c.	Determine market grade requirements for soybeans.	2.7
	d.	Explain the purpose of the futures contract in soybean marketing.	2.7
	e.	Discount the price of soybeans for test weight, moisture, and damage.	2.6
	f.	Describe the supply and demand relationship for soybeans.	2.6
	g.	Select the month when it would be most profitable to market soybeans.	2.5
	h.	Identify sources of soybean marketing information.	2.4
	i.	Explain how local soybean prices are determined.	2.4
	j.	Explain the relationship between the livestock industry and the soybean market.	2.3
9.	Production economics.		2.8
	a.	Budget the annual costs and returns in soybean production.	2.8
	b.	Keep and analyze production records for soybean enterprise.	2.8
	c.	Determine results obtained from the modification or adoption of new practices and compare the results with those obtained from experimental studies and local demonstration plot.	2.8
	d.	Calculate various efficiency factors in soybean production.	2.7
	e.	Determine realistic goals in soybean production.	2.7

SUGAR BEET FARMER

Other Titles: Commercial Vegetable Producer, Forage Producer, Farm Manager.

Job Description:

The Sugar Beet Farmer produces sugar beets under contract with a sugar beet company. Determines kind and amount of crop to be grown, according to market conditions, weather and size and location of farm. Selects and purchases seed, fertilizer and farm machinery and arranges with buyers for sale of crop. Hires and directs farm workers engaged in planting, cultivating and harvesting the crop. Performs various duties of farm workers, depending on size and nature of farm, including setting up and operating farm machinery.

Competencies Identified and Validated

N = 432*

Competencies		Weighted Mean**
1.	Perform general management operations.	3.0
a.	Adjust management to meet weather conditions.	3.5
b.	Do own bookkeeping.	3.5
c.	Prepare a farm income tax return.	3.4
d.	Negotiate the purchase of equipment.	3.4
e.	Negotiate leases.	3.3
f.	Negotiate production credit, bank, etc.	3.3
g.	Plan a farm budget.	3.2
h.	Store farm equipment.	3.2
i.	Maintain a farm inventory.	3.1
j.	Employ a certified public accountant.	2.3
k.	Utilize a hired bookkeeper.	1.7
2.	Plan schedules of production.	3.2
a.	Schedule farm work when needed.	3.7
b.	Supervise farm labor.	3.6
c.	Purchase certified seed.	3.5
d.	Hire farm labor.	3.3
e.	Test seed varieties.	2.9
f.	Treat seed varieties.	2.9
g.	Utilize schedule for harvesting by sugar beet company with cooperation from association.	2.9
h.	Utilize sugar beet association for assistance.	2.8

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* Responses from 432 Sugar Beet Farmers in 3 states. Survey conducted by Department of Agricultural Education, Utah State University, Logan, Utah 84321.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

3.	Interpret soil conditions.	3.1
a.	Utilize soil test information for insect control.	3.9
b.	Utilize soil test information for production per acre.	3.2
c.	Experiment with crop rotation.	3.2
d.	Take soil nitrogen fertilizer tests.	3.1
e.	Utilize soil test information for sugar percentage.	2.9
f.	Utilize soil test information for weed control.	2.8
g.	Utilize the petiole nitrate tests.	2.8
4.	Diagnosing pest injury.	3.0
a.	Identify nematode injury.	3.4
b.	Identify root rot magot.	3.3
c.	Utilize services of company fieldman.	3.2
d.	Diagnose curley top disease.	3.1
e.	Control leafhoppers.	3.0
f.	Identify virus yellow disease transmitted by aphid.	2.9
g.	Identify grasshoppers.	2.9
h.	Identify leafhoppers.	2.9
i.	Identify weeds.	2.9
j.	Utilize services of agricultural research service ARS.	2.9
k.	Utilize services for cooperative extension.	2.8
5.	Handling pesticides.	3.3
a.	Follow safety precautions when applying pesticides.	3.8
b.	Utilize chemical pesticides on farm.	3.4
c.	Use pesticides by grower.	3.3
d.	Use barnyard and green manures.	3.2
e.	Schedule determined by technical assistance.	3.0
6.	Fertilizing methods.	3.2
a.	Figure how much to apply per acre.	3.5
b.	Figure the kind of nitrogen fertilizer to apply.	3.3
c.	Schedule when to use nitrogen fertilizer.	3.2
d.	Use barnyard and green manures.	3.2
e.	Schedule determined by technical assistance.	3.0
7.	Planting methods.	3.0
a.	Prepare seed bed before planting.	3.9
b.	Select earliest possible date to plant.	3.8
c.	Use an incorporated method in applying fertilizers and pesticides.	3.1
d.	Use pelleted seed.	2.6
e.	Use non-pelleted seed.	2.3
f.	Incorporate fertilizer only when planting.	2.1

8.	Harvesting methods.	2.6
a.	Utilize the multiple row harvester.	3.0
b.	Utilize the tank type lifting method.	2.7
c.	Utilize the lifter loader method.	2.6
d.	Utilize the flailing method.	2.5
e.	Utilize the mechanical topping method.	2.5
f.	Utilize the single row harvester.	2.1
9.	Irrigating methods.	3.1
a.	Design irrigation systems.	3.5
b.	Select watering schedule for beets.	3.5
c.	Repair irrigation systems.	3.4
d.	Use sprinkler and furrow irrigation only.	3.2
e.	Use furrow type irrigation only.	2.9
f.	Use sprinkler irrigation only.	2.5
g.	Use company advisory personnel for water schedules.	2.4
10.	Operating equipment correctly.	3.7
a.	Operate, maintain, and repair planting equipment.	3.8
b.	Operate, maintain, and repair beet harvester.	3.8
c.	Adjust harvester to eliminate unnecessary damage to beet.	3.8
d.	Operate, maintain, and repair cultivation equipment.	3.7
e.	Operate, maintain, and repair thinning equipment.	3.7
f.	Operate tractors.	3.6
g.	Operate, maintain, and repair fertilizer equipment.	3.5

SWEET POTATO FARMER

Other Titles: Sweet Potato Producer, Sweet Potato Grower.

Job Description:

Persons involved in this occupation must know best soil types and soil nutrient requirements for sweet potato production; must prepare land for planting; plant and cultivate the growing crop; recognize sweet potato diseases and insects and the controls for each; harvest the mature crop; cure and store the crop until marketed; and keep the records needed in any business enterprise.

Competencies Identified and Validated

N = 30*

Competencies		Weighted Mean**
1.	Soil test and land area analysis.	3.5
a.	Know soil type best for sweet potatoes.	3.8
b.	Determine pH of the soil.	3.5
c.	Determine the soil nutrients needed.	3.5
d.	Determine moisture and other climatic needs.	3.5
e.	Determine contour if necessary.	3.4
f.	Make necessary nutrient deficiency adjustment.	3.3
2.	Preparation of land and planting.	3.6
a.	Locate planting site.	3.7
b.	Prepare seed bed.	3.7
c.	Plant.	3.7
d.	Grow sweet potato slips.	3.6
e.	Develop crop rotation plans.	3.4
3.	Machinery and its maintenance.	3.6
a.	Select adequate sweet potato planting equipment.	3.8
b.	Select proper sweet potato cultivating equipment.	3.6
c.	Overhaul, repair, and proper maintenance of sweet potato equipment.	3.6
d.	Machine shop work.	3.4
4.	Select variety.	3.4
a.	Know variety needed for markets.	3.7

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* Responses from 30 Sweet Potato Producers in Louisiana. Survey conducted by Department of Agricultural Education, Louisiana State University, Baton Rouge, Louisiana 70803.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

b.	Know planting date.	3.5
c.	Know maturity time.	3.2
d.	Calculate yield.	3.2
e.	Know retort use.	3.3
f.	Know formula.	3.2
g.	Know proper can fill.	3.2
5.	Packaging.	2.9
a.	Use proper storage.	3.3
b.	Understand dating of cans.	2.8
c.	Know use of boxing machine.	2.8
d.	Know use of labeling machine.	2.6

TOBACCO FARMER

Other Titles: Tobacco Grower, Tobacco Producer.

Job Description:

A Tobacco Farmer is a person competent in both managerial and decision making skills and in the carrying out of the necessary technical improved (approved) practices which results in high yields of quality tobacco. Significant competencies are needed by both the owner-producer and the tenent-producer. Examples of the broad areas of work (competency areas) Tobacco Farmers perform are: planning to grow tobacco; producing a plentiful supply of sturdy, healthy plants; growing the tobacco, which includes fertilizing, preparing land, tillage practices, and controlling insects, diseases and suckers; harvesting, housing and curing the crop; and stripping and marketing.

Competencies Identified and Validated

		Weighted Means by Occupation**		
Competencies		Flue Cured N = 35	Burley N = 30	Dark Fired N = 30
1.	Plan to grow tobacco.	3.0	2.9	3.2
	a. Select a profitable variety of tobacco to grow.	3.7	3.5	3.6
	b. Select land for tobacco.	3.6	3.6	3.8
	c. Understand the importance of tobacco in the farm business.	2.9	2.7	2.8
	d. Understand the supply and demand for tobacco.	2.5	2.5	2.9
	e. Understand the importance of tobacco as a cash crop in the State.	2.5	2.4	2.8
2.	Produce tobacco plants.	3.5	3.3	3.4
	a. Control diseases in the tobacco plant bed.	3.9	3.6	3.7

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* Responses from Tobacco Farmers in South Carolina. Survey conducted by Department of Vocational Education, University of Kentucky, Lexington, Kentucky 40506.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

Competencies	Flue Cured Tobacco	Burley Tobacco	Dark Fired Tobacco
b. Understand the importance of having good tobacco plants.	3.8	3.6	3.6
c. Treat the tobacco plant bed for weed control.	3.8	3.5	3.7
d. Seed the tobacco plant bed.	3.8	3.6	3.6
e. Control insects in the tobacco plant bed.	3.8	3.6	3.6
f. Locate the tobacco plant bed in a good place.	3.6	3.7	3.5
g. Prepare the plant bed for seeding.	3.6	3.5	3.5
h. Fertilize the plant bed.	3.5	3.5	3.6
i. Check beds regularly.	3.5	3.2	3.6
j. Select proper cover.	3.5	2.9	3.2
k. Ditch tobacco beds.	3.3	2.8	3.3
l. Provide for tobacco plant bed next year.	3.1	2.8	3.1
m. Water tobacco beds.	3.0	3.5	3.1
n. Regulate the growth of tobacco plants in the bed by seeding date.	3.0	2.6	3.0
o. Water bed before pulling plants.	3.0	---	---
3. Grow tobacco.	3.5	3.2	3.0
a. Fertilize the tobacco crop.	3.8	3.7	3.7
b. Prepare land for tobacco.	3.8	3.4	3.7
c. Control insects in the tobacco field.	3.8	3.5	3.7
d. Transplant tobacco.	3.7	3.6	3.7
e. Control diseases in the tobacco field.	3.7	3.3	3.6
f. Apply chemicals for sucker control.	3.7	---	3.6
g. Top tobacco.	3.6	3.5	3.7
h. Sucker tobacco.	3.6	2.7	---
i. Treat for nematodes and wireworms.	3.5	---	---
j. Understand that a proper soil type is necessary to produce a good yield of high quality tobacco.	3.4	3.4	3.7
k. Cultivate tobacco.	3.4	3.2	3.5
l. Space plants in field.	3.4	3.1	3.6
m. Use soil tests.	3.1	3.1	3.2
n. Lime soil.	2.6	3.0	3.5
o. Utilize farm residues.	2.6	2.7	2.9
p. Understand that the nicotine content of tobacco depends, in part, upon weather and practices used while tobacco is in the field.	2.4	1.9	2.9

Competencies	Flue Cured Tobacco	Burley Tobacco	Dark Fired Tobacco
4. Harvest, house, and cure the crop.	3.3	2.8	3.3
a. Cure tobacco with heat.	3.8	3.0	3.7
b. House tobacco after curing.	3.8	3.2	3.4
c. Get curing barn ready for tobacco.	3.3	2.9	3.3
d. Cut stalks and turn up roots.	3.3	---	---
e. Understand the importance of ripe tobacco.	3.2	2.8	3.4
f. Space sticks on tier pole.	3.2	3.2	3.6
g. After harvest, seed tobacco land with small grain.	2.4	2.7	---
h. Cure tobacco with air.	---	3.0	---
i. Space plants on stick.	---	2.9	---
j. Sharpen and count tobacco sticks.	---	1.8	---
k. Use fans in barn.	---	1.8	---
5. Market tobacco (and store if necessary).	2.7	---	3.1
a. Bulk tobacco in a pack house when it cannot be placed on market.	3.3	---	3.3
b. Clean up pack house and storage room.	3.0	---	2.8
c. Go to market with tobacco.	2.6	---	3.4
d. Make grades in relation to market demands.	2.5	---	3.3
e. Is present when sold.	2.3	---	3.2
f. Prepare stripping room, clean, heat and lights.	---	---	3.1
g. Never hangs stripped tobacco in the barn.	---	---	2.8

TREE FRUIT GROWER

Other Titles: Tree Fruit Farmer, Tree Fruit Producer.

Job Description:

Select and develop sites, prepare site, select varieties, propagate and prune trees, plant trees, maintain soil and trees, and harvest and market fruit. Operate and maintain tillage and harvest equipment. Operate roadside markets. Work with management and labor personnel.

Competencies Identified and Validated

N = 28*

Competencies	Weighted Mean**
1. Selection of variety.	2.8
a. Select appropriate varieties of fruit trees for specific purposes.	3.2
b. Select varieties of fruit trees adapted to the soil and climate of the area.	3.0
c. Choose trees on root stocks adapted to the extremes of heat or cold of the area.	2.5
d. Specify root stocks for the trees to be planted.	2.3
2. Propagation.	2.4
a. Make cleft grafts (top working).	2.5
b. Select appropriate grafting materials (wood and tool).	2.5
c. Bridge graft trees for mechanical and rodent repair.	2.4
d. Bud seedling trees of appropriate kinds.	2.2
3. Selection of site.	2.8
a. Prepare the soil for planting fruit trees.	3.3
b. Select sites which have air drainage and the areas where damage from frost is a limiting factor in production.	3.0
c. Prepare the site for planting the trees.	3.0
d. Select sites having adequate water drainage.	2.8
e. Select sites having adequate water for irrigation.	2.5
f. Add organic matter to the soil where needed.	2.5

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* Responses from 28 Fruit Growers in 9 states. Survey conducted by Department of Agribusiness and Natural Resources Education, Michigan State University, East Lansing, Michigan 48824.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

g.	Test the soil of proposed sites for toxic salts.	2.2
4.	Field planting.	2.8
a.	Plant trees in the orchard according to plan.	3.6
b.	Water newly planted trees.	3.0
c.	Lay out the orchard for greatest efficiency in production and maintenance.	2.9
d.	Minimize erosion in newly planted orchard.	2.8
e.	Mulch newly planted trees where the practice is recommended.	2.6
f.	Use appropriate starter solutions on newly planted trees where recommended.	2.6
5.	Pruning.	2.9
a.	Prune newly planted trees.	3.9
b.	Prune trees to establish scaffold branches.	3.5
c.	Select and use appropriate system of training for each kind of fruit.	3.2
d.	Prune trees to remove dead and/or diseased branches.	2.9
e.	Use limb spreaders to make stronger trees and cause earlier fruiting.	2.9
f.	Prune trees for mechanical harvesting.	2.7
g.	Prune trees to avoid parallel branches and/or cross branches occupying the same space.	2.6
h.	Prune trees to encourage optimum color of fruit.	1.8
6.	Fertilization.	2.8
a.	Take appropriate soil samples for nutrient and pH testing.	3.6
b.	Specify fertilizer application for the site.	3.0
c.	Apply a fertilizer to the soil via mechanical applicators (granules, liquid, gas).	3.0
d.	Specify application of lime for the site.	2.9
e.	Adjust fertilizer application to provide optimum quality of fruit.	2.8
f.	Make foliar application of plant nutrients to orchard trees.	2.6
g.	Prepare material for foliar feeding.	2.5
h.	Take leaf samples for quantitative analysis by the Agricultural Experiment Station.	2.5
i.	Apply fertilizer to trees via irrigation water.	2.2
7.	Irrigation.	2.5
a.	Apply irrigation water according to specifications.	2.9
b.	Make moisture tests of soil to determine need for irrigation.	2.6
c.	Keep daily evaporation records to determine need for irrigation.	2.5

	d.	Develop a specified irrigation system under supervision.	2.4
	e.	Prepare soil to receive irrigation water.	2.3
8.	Disease and insect control.		3.1
	a.	Read and interpret the contents, directions for use, and cautions on the label of insecticides and fungicides.	3.6
	b.	Apply insecticides and fungicides to fruit trees as recommended using power equipment.	3.6
	c.	Select and wear protective clothing while working with fungicides and insecticides.	3.3
	d.	Keep systematic spray records.	3.3
	e.	Mix insecticides and fungicides for control of insects and diseases of fruit trees.	3.2
	f.	Protect wounds on trees.	3.0
	g.	Carry out an insect and disease control program by eliminating breeding and over-wintering places.	3.0
	h.	Control deer, rodents, birds, etc. that are pests in orchards.	3.0
	i.	Select disease resistant trees for planting.	2.7
	j.	Select disease resistant varieties where available.	2.6
	k.	Use attractants and/or traps to anticipate a rise in insect population.	2.4
9.	Harvesting.		2.8
	a.	Determine optimum time to harvest fruit crop.	3.3
	b.	Determine the most appropriate method of harvesting fruit.	3.0
	c.	Use handling machinery (forklifts, bulk bins, cooling platforms).	3.0
	d.	Sort harvested fruits into grades.	2.9
	e.	Operate grading and/or sorting machines.	2.6
	f.	Use harvesting aids (platforms, squirrels, etc.).	2.5
	g.	Harvest fruits grown in the area by appropriate methods.	2.3
10.	Pollination and fruit set.		2.8
	a.	Assure adequate pollination by use of bees where appropriate.	3.1
	b.	Assure pollination by the choice of varieties where appropriate.	3.1
	c.	Thin fruit by use of chemicals.	3.0
	d.	Thin fruit by hand.	2.9
	e.	Pollinate blossoms by bringing pollen to the trees to be pollinated.	2.0
11.	Management.		2.8
	a.	Keep accounts of fruit enterprises which will provide information needed for income tax reports.	3.1

b.	Determine the most economical sources of supply.	3.0
c.	Identify outlets for fruit products of the farm.	3.0
d.	Compare costs in relation to production with acceptable standards (labor costs per acre, production per acre, return per man, etc.).	2.9
e.	Adjust inputs (labor, machinery, fertilizer, chemicals, etc.) based on relative costs and anticipated returns.	2.9
f.	Determine production performance of each fruit enterprise in relation to acceptable standards.	2.8
g.	Keep accounts which will allow comparison of performance with farms reported by Cooperative Extension Service.	2.8
h.	Identify sources of supplies for fruit production.	2.8
i.	Determine outlets offering best returns for fruits from the farm.	2.8
j.	Use fruit farm management analyses to determine profitability of the business.	2.7
k.	Use farm management analyses of fruit farms to determine uses of credit.	2.6
l.	Adjust the fruit farming program based on reports from reliable sources.	2.5
m.	Use fruit farm management analyses to determine cash flow in the business.	2.5
n.	Use farm management analyses to determine appropriate credit terms.	2.4
12.	Labor management.	3.5
a.	Accept assignments of supervisor with enthusiasm.	3.6
b.	Complete tasks in an acceptable manner.	3.5
c.	Work constructively with fellow workers.	3.5
d.	See and anticipate next task which will contribute to the success of the enterprise.	3.5
e.	Stimulate fellow workers to perform tasks at optimum standard of workmanship.	3.4
13.	Marketing.	2.4
a.	Label varieties of fruit.	2.4
b.	Determine method of selling fruit crop.	2.7
c.	Select necessary equipment and supplies needed for specific roadside market facility.	2.7
d.	Display fruit for retail sale.	2.6
e.	Prepare fruit for the roadside market.	2.6
f.	Grade fruit to meet government standards for retail sale.	2.6
g.	Weigh or measure amount of fruit purchased by "pick-your-own" customers.	2.5

h.	Suggest varieties of fruit to meet needs of the customer.	2.5
i.	Package fruit for retail sale.	2.5
j.	Maintain safe practices among customers for a "pick-your-own" marketing program.	2.5
k.	Label varieties of fruit.	2.4
l.	Meet customers in the farm market and to determine their needs and desires.	2.4
m.	Plan a "pick-your-own" marketing scheme for tree fruits.	2.0
n.	Plan access and exit for the roadside fruit market area.	2.0
o.	Lay out driveways and parking space for a roadside market.	1.9
p.	Plan the layout for a roadside fruit market.	1.8
14.	Farm power and equipment.	3.2
a.	Operate the tractors and other power units commonly found on tree fruit farms of the area.	3.6
b.	Identify diesel fueled and gasoline fueled internal combustion engines.	3.6
c.	Operate equipment used on tree fruit farms (includes tillage, seeding, fertilizer and pesticide applicators, cultivation, harvesting, handling, storage, and processing equipment commonly used in the area).	3.6
d.	Lubricate, change oil and filters, and service air cleaners on the power units commonly found on the power units used on tree fruit farms of the area as specified in the operator's manual.	3.5
e.	Check operation of the hydraulic systems on the area as specified in the operator's manual.	3.5
f.	Maintain and service tires on machines commonly found on tree fruit farms of the area as specified in the operator's manual.	3.3
g.	Adjust equipment used on tree fruit farms (includes tillage, seeding, fertilizer and pesticide applicators, cultivation, harvesting, handling, storage, and processing equipment commonly used in the area).	3.3
h.	Perform minor maintenance and service operations on the fuel system of the power units commonly found on the tree fruit farms of the area in accordance with the operator's manual.	3.2

i.	Perform minor maintenance and service operations on the cooling systems of the power units commonly used on tree fruit farms of the area in accordance with the operator's manual.	3.2
j.	Identify four-stroke cycle and two-stroke cycle engines.	3.1
k.	Diagnose malfunctioning of equipment used on tree fruit farms (includes tillage, seeding, fertilizer and pesticide applicators, cultivation, harvesting, handling, storage, and processing equipment commonly used in the area).	3.1
l.	Perform maintenance operations on the hydraulic systems of machines commonly found on the tree fruit farms of the area as specified in the operator's manual.	3.1
m.	Identify defective parts on equipment used on tree fruit farms (includes tillage, seeding, fertilizer and pesticide applicators, cultivation, harvesting, handling, storage, and processing equipment commonly used in the area).	3.0
n.	Diagnose malfunctioning of the power units commonly found on the tree fruit farms of the area.	3.0
o.	Replace defective parts on equipment used on tree fruit farms of the area (includes tillage seeding, fertilizer and pesticide applicators, cultivation, harvesting, handling, storage, and processing equipment).	2.8
p.	Locate equipment parts in the parts book.	2.5

VEGETABLE GROWER

Other Titles: Vegetable Farmer, Vegetable Farm Manager, Commercial Producer of Vegetables, Vegetable Gardener, Garden Farmer, Market Gardener, and Truck Farmer.

Job Description:

Raises vegetables. Determines kind and amount of crop to be grown, according to market conditions, weather, and size and location of farm. Select and purchase seed, fertilizer, and farm machinery and arrange with buyers for sale of crop. Hire and direct farm workers engaged in planting, cultivating, and harvesting crop, such as beets, beans, onions, peas, and potatoes. Performs various duties of farm workers, depending on size and nature of farm, including setting up and operating farm machinery.

Competencies Identified and Validated

N = 105*

	Competencies	Weighted Mean**
1.	Plan for growing vegetable crops.	3.2
a.	Select varieties adapted to area and acceptable by market.	3.9
b.	Select seeds or transplants of good quality.	3.8
c.	Select sites suitable for vegetable crops.	3.8
d.	Schedule plantings for orderly harvesting and marketing.	3.7
e.	Schedule plantings at proper times for best success.	3.6
f.	Know labor requirements of crops.	3.5
g.	Understand the supply and demand for vegetables.	3.3
h.	Understand the importance of vegetables in the farm business.	2.8
i.	Understand the importance of vegetables as a cash crop and the state's agriculture.	2.6
j.	Understand importance of vegetables as a food and in the diet.	2.2
k.	Understand importance of vegetables as food.	2.2
2.	Growing of vegetable crops.	3.5
a.	Control insects using approved methods.	3.9
b.	Control diseases using approved methods.	3.8

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* Responses from 105 Vegetable Growers in 6 states. Study conducted by Department of Vocational Education, University of Kentucky, Lexington, Kentucky 40506.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

d. Use effective seeding and transplanting techniques.	3.6
e. Use soil tests to determine lime and fertilizer needs.	3.6
f. Use suitable soil preparation.	3.6
g. Use effective weed control methods including rotation, cultivation, and approved herbicides.	3.6
h. Provide adequate soil water by irrigation when needed.	3.4
i. Use special cultural techniques for individual crop.	
(1) Stake vegetable crops (tomatoes, cucumbers, pole beans).	3.0
(2) Prune tomatoes.	2.8
(3) Blanch cauliflower.	2.7
3. Harvest, grade, process, store, and market vegetable crops.	3.4
a. Harvest crops at proper stage.	3.8
b. Market vegetables.	3.7
c. Harvest at proper time for each crop.	3.6
d. Harvest with minimum damage to crop.	3.6
e. Grade and sort vegetables.	3.3
f. Store vegetables properly.	3.2
g. Wash and cool vegetables where appropriate.	3.2
h. Package vegetables.	3.1

CHEMICAL APPLICATOR

Other Titles: Agricultural Technician, Biological Technician, Gardener, Groundskeeper, Farm Worker, Equipment Operator, Chemical Equipment Salesperson.

Job Description:

Provides information to others for the purpose of selecting chemicals and application equipment; applies chemicals to agricultural and ornamental crops; repairs and maintains equipment for applying agricultural chemicals; uses accepted business procedures for keeping records; practices accepted human relations with work-related personal contacts.

Competencies Identified and Validated

N = 36*

Competencies	Weighted Mean**
1. Describe chemical characteristics.	3.0
a. Read and interpret package labels and other guidelines for safety: clothing, environment, symptoms of contamination, and antidotes.	4.0
b. Read and interpret package labels: rates, schedule, method and cost of application, residuals, and expected performance.	3.9
c. Recommend kinds of pesticides and rates to be used in specific situations based upon environmental, economic, and performance considerations.	3.0
d. Name businesses and agencies, both private and public, available for analysis and/or consultation on chemicals and pests.	2.8
e. Identify insects and other pests that are economically controlled by chemicals.	2.7
f. Determine storage hazards of chemicals.	2.7
(1) Describe effects of moisture, temperature, and pressure on chemicals.	
(2) Describe reasons certain chemicals should not be stored together or in certain locations.	

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* Responses from 36 Chemical Applicators in 14 states. Survey conducted by Department of Agricultural Education, Clemson University, Clemson, South Carolina 29631.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

g. Describe compatibility of equipment and chemicals. 2.6

  (1) Identify chemical characteristics affecting compatibility: petroleum vs. water base, soluble vs. suspension, and abrasive vs. non-abrasive.

  (2) Describe characteristics of equipment which affect compatibility with chemicals.

h. Recommend best and alternative chemicals. 2.3

2. Describe equipment characteristics. 2.8

a. Describe protective equipment needed to handle agricultural chemicals (protection of humans, facilities, equipment, and animals). 3.9

b. Describe protective clothing to avoid contamination of body tissues. 3.8

c. Describe places and methods of storage. 3.2

d. Describe general characteristics of hand and ground sprayers. 3.1

e. Recognize and describe equipment parts and maintenance requirements for: hoses, filters, pumps, pressure gauges, pressure regulators, tanks, nozzles, agitators, and cut-off and diverter valves. 3.0

f. Describe general characteristics of multi-purpose sprayers: tractor mounted, self-propelled, and wheel-mounted drawn. 2.9

g. Describe features affecting compatability of equipment and chemicals. 2.8

h. Describe specific uses of various nozzles: flat fan, even fan, flooding, boomless, off-center, solid cone, hollow cone, and whirl chamber. 2.8

i. Describe equipment required for safe disposal of chemicals and containers. 2.7

j. Describe capabilities of granular and dust equipment. 2.5

  (1) Dust - air and fan; electronic charged.

  (2) Granular - gravity-feed; force-feed.

k. Describe general capabilities of fumigator equipment. 2.3

  (1) Low-volatility liquid (gravity-forced pressure).

  (2) Gas type.

l. Describe characteristics of general-use sprayers. 1.9

- m. Describe general features and characteristics of specialized equipment such as: 1.8
    - (1) High pressure sprayers.
    - (2) Air-blast sprayers.
    - (3) Low-volume "mist blowers".
    - (4) Ultra-low volume sprayers (hydraulic driven fans) at distribution points.

3. Know how to apply chemicals. 2.9

- a. Follow accepted procedures in accident situations (emergency telephone numbers, physicians' names, first-aid centers, and procedures). 3.9
- b. Recognize pesticide poisoning symptoms. 3.7
- c. Warn persons prior to applications of hazardous chemicals - without undue alarm. 3.3
- d. Calculate pesticide quantity to be applied to a given area. 3.3
- e. Recognize symptoms of pesticide damage or residues due to chemical selection or application errors (burns, slowed growth, leaf-drop, etc.). 3.3
- f. Use human and wildlife safety measures. 3.2
    - (1) Avoid hazardous environmental conditions (winds, heat, volatile materials, threatening rains). 3.3
    - (2) Add chemicals to tanks, using approved techniques and materials (funnels, hoses, check valves, etc.). 3.2
    - (3) Read and obey safety precautions on equipment and packages. 3.2
    - (4) Use protective clothing (gloves, goggles, masks, rubber apparel). 3.2
- g. Calculate pesticide and/or custom application bills. 3.2
- h. Select chemicals for specific problems. 3.2
    - (1) Observe specific warnings and first-aid measures. 3.5
    - (2) Determine safety guidelines and capabilities of the applicator. 3.6
    - (3) Match chemicals with available protective equipment. 3.4
    - (4) Match concentration and specific job. 3.4

(5) Calculate pesticide volume required.	3.4
(6) Match chemicals to conditions.	3.3
(7) Determine capability of available equipment.	3.3
(8) Assess compatibility of selected chemicals.	3.1
(9) Select mixing methods.	2.8
(10) Dispose of used containers.	2.8
i. Select time of application.	3.1
(1) Identify current legal and moral restrictions on use.	3.3
(2) Select application pattern (broadcast, directed spray, band treatment, post or pre-emerge).	3.2
(3) Match rate of application with plant condition, pest population, environment, etc.	3.2
(4) Identify harvest-delay and/or re-entry-delay requirements for specific chemicals and treatments.	2.8
j. Inspect respirators for cleanliness, effectiveness, and proper fit.	2.9
k. Recognize capabilities of hand sprayers (air pumps, CO_2 and compressed air).	2.8
l. Select and match nozzles for equipment type, chemical used, and pattern of application.	2.8
m. Select surfactants or wetting agents for specific situations.	2.8
n. Select and/or supervise storage procedures.	2.7
(1) Select storage facilities for factors of moisture, temperature, etc.	2.8
(2) Determine safe storage distances of various chemicals.	2.6
o. Calculate coverage.	2.7
(1) Use calibration charts prior to equipment adjustment for coverage.	3.1
(2) Determine critical distances: row-space, boom or coverage width, distance traveled (tape, pacing, etc.).	2.7
(3) Read and interpret rate charts such as "pint jar" or "1/128 Acre" methods.	2.3

p. Determine compatibility of equipment and chemicals.	2.6
(1) Identify chemical characteristics affecting compatibility.	2.6
(2) Identify equipment characteristics which affect compatibility.	2.7
q. Recognize and describe symptoms of common pests as follows:	2.6
(1) Symptoms of insects and nematodes (chewing, mining, sucking: holes, wilting, discoloration, etc.).	2.8
(2) Symptoms of fungi and bacteria.	2.4
r. Recognize common pests such as:	2.6
(1) Insects of plants and animal enterprises and homesteads.	2.9
(2) Weeds of row crops, pastures, ponds, forests.	2.5
(3) Fungi and bacteria of plant and animal enterprises and homesteads.	2.4
s. Select nozzles and adjust pressure for various pesticide applications. (Flat fan @ 30 psi; solid cone @ 60 psi, etc.).	2.4
t. Supervise and/or perform the mixing of chemicals and carrying agents.	2.4
u. Determine the discharge rate of the following equipment:	2.3
(1) Nozzle capacity.	3.2
(2) Area covered.	2.7
(3) Nozzle pressure.	2.4
(4) Ground speed of applicator.	2.3
(5) For air blast equipment, air velocity.	0.8
v. Recognize differing features of various ground sprayers.	2.3
4. Adjust and care for equipment.	2.6
a. Check application equipment for leaks, clogs, improper equipment, and/or other malfunctions.	3.4
b. Add chemicals to tanks and hoppers using funnels, hoses, check valves, etc.	3.2
c. Adjust equipment as follows:	2.9
(1) Maintain consistent and appropriate speeds.	3.0

(2) Set correct pressures.	3.0
(3) Adjust equipment height and width to achieve desired distribution pattern.	2.9
(4) Adjust mixing apparatus.	2.8
d. Check personal protection equipment such as:	2.7
(1) Check respirators for fit, effectiveness, and proper fit.	2.9
(2) Check gloves, goggles, and other protective clothing.	2.6
e. Replace and/or repair nozzles, hoses, cut-off valves, etc.	2.7
f. Prepare equipment for storage as follows:	2.4
(1) Drain systems prior to storage.	2.6
(2) Flush systems of residues.	2.4
(3) Remove residues of dusts and granules from hoppers, deflectors, fans, etc.	2.1
g. Repair sprayer pumps (rotors, pistons, rollers, seals).	2.3
5. Repair and maintain equipment.	2.5
a. Supervise and/or perform maintenance and repairs.	2.9
(1) Follow operator's manual for adjustments.	3.4
(2) Lubricate according to manuals.	3.0
(3) Repair and/or maintain sprayers.	3.0
(a) Main delivery lines (hoses, clamps, valves, pipes).	
(b) Pumps.	
(c) Agitators.	
(d) Nozzles.	
(e) Strainers.	
(f) Pressure regulators.	
(g) Tanks (flush, clean, patch, replace).	
(h) Frame (clean, repair, modify).	
(4) Repair and/or maintain dusters.	2.6
(a) Pulleys and belts.	
(b) Hoppers.	
(c) Distribution lines.	
(d) Fans.	
(e) Frames.	

(5)	Repair and/or maintain fumigators (including ammonia rigs).	2.4
	(a) Hoses and pipes (inspects, flushes, replaces). (b) Tanks (inspects, flushes, repairs, replaces). (c) Injectors (inspects, flushes, repairs, replaces).	
b.	Supervise and/or use supporting equipment and tools as follows:	2.4
(1)	Grease guns.	3.1
(2)	Trucks - motor vehicle.	3.1
(3)	Steel tapes and other rulers (linear scales).	3.1
(4)	Wrenches (box, open end, socket, adjustable, etc.).	3.0
(5)	Screwdriver.	3.0
(6)	Pliers.	3.0
(7)	Grind wheels and wire brushes.	3.0
(8)	Bearing and gear pullers.	2.9
(9)	Bearing and seal presses.	2.9
(10)	Air tanks, hoses, and accessories.	2.9
(11)	Fire extinguisher.	2.9
(12)	Billing equipment (manual and/or machine).	2.7
(13)	Oil cans.	2.7
(14)	Tractors - garden and/or utility.	2.4
(15)	Weight scales (balance, spring).	2.4
(16)	Electric soldering iron.	2.3
(17)	Jacks - hydraulic, screw, and mechanical.	2.3
(18)	Steam cleaners.	2.2
(19)	Cash registers.	2.2
(20)	Electric arc welders.	2.1
(21)	Air wrench.	2.1
(22)	Soil augers.	2.1
(23)	Paint sprayers and paint brushes.	2.1
(24)	Electric hand drills and drill presses.	2.0
(25)	Solvents (alcohol or petroleum distillates).	2.0

(26)	Power and hand operated hacksaws.	1.9
(27)	Fork lifts (manual or power).	1.9
(28)	Hammers and/or hand saws.	1.8
(29)	Pipe dies and reamers.	1.8
(30)	Ammonia solutions.	1.8
(31)	Two-way radios.	1.8
(32)	Steel squares.	1.8
(33)	Oxyacetyline welders.	1.7
(34)	Hand trucks (bag).	1.7
(35)	Containers (plastic, metal, cardboard, fiberglass, etc.).	1.6
6.	Use business procedures and human relations.	2.9
a.	Use these personality traits on the job.	3.5
(1)	Honest.	4.0
(2)	Careful.	3.8
(3)	Dependable.	3.8
(4)	Cooperative.	3.7
(5)	Accurate.	3.6
(6)	Conscientious.	3.6
(7)	Responsible.	3.6
(8)	Mature.	3.5
(9)	Alert.	3.4
(10)	Confidence.	3.4
(11)	Enthusiastic.	3.4
(12)	Efficient.	3.4
(13)	Loyal.	3.3
(14)	Patient.	3.3
(15)	Energetic.	3.3
(16)	Kind.	3.3
(17)	Agreeable.	3.2
(18)	Appreciative.	3.2
(19)	Tactful.	3.1
(20)	Tolerant.	3.1
(21)	Realistic.	2.5

- b. Maintain sales records. 3.0
  - (1) File and/or post forms for orders or deliveries of products and services. 3.4
  - (2) Properly complete charge and cash billing forms for warehouse, retail, or wholesale orders. 3.2
  - (3) Receive cash, checks, or purchase orders for supplies and services. 3.0
  - (4) Prepare sales tickets. 2.2
    - (a) Calculate charges (amounts for various services provided to customers).
    - (b) Calculate discounts and sales tax, extend unit prices, etc.
- c. Practice accepted human relations techniques and show personality traits. 2.8
  - (1) Take instructions or directions from:
    - (a) Employers (use of written and mental notes).
    - (b) Fellow employees.
    - (c) Customers.
  - (2) Relay verbal and written messages to: 3.2
    - (a) Employers.
    - (b) Fellow employees.
    - (c) Customers.
    - (d) Other business contacts such as suppliers.
  - (3) Properly greet: 2.8
    - (a) Fellow employees.
    - (b) Employers.
    - (c) Customers.
    - (d) Other business contacts.
  - (4) Recognize the basic human needs which play a part in worker motivation (e.g., life sustenance, physical safety, respect, esteem, self-realization, and actualization). 1.7
- d. Manage business resources. 2.8
  - (1) Relay and/or receive job instruction. 3.9
  - (2) Use radio, telephone, and other communications systems. 3.1

(3) Formulate daily objectives, (jointly and/or independently) for organization and delegation/distribution of manpower, equipment, facilities, and goods. 3.0

(4) Develop awareness of management and ownership responsibilities and general risks and rewards of business operations. 2.8

(5) Use basic business machines for mathematical calculations. 2.6

(6) Monitor capital flow, accounts payable, and accounts receivable. 2.4

(7) Practice inter-departmental (section) coordination of capital, materials, equipment, facilities, processes, functions, and manpower. 2.4

(8) Follow accepted procedures for credit investigation and/or applications prior to delivery of materials. 2.3

e. Maintain quanity and quality inventory. 2.6

(1) Maintain security of merchandise, equipment. 3.1

(2) Maintain freight records and verify bill of laden with merchandise receipt and condition. 2.9

(3) Order, reorder, and receive merchandise. 2.7

(4) Use inventory forms to maintain adequate quantities and varieties of supplies. 2.7

(5) Keep suitable stock on display in an acceptable arrangement. 2.5

(6) Maintain housekeeping standards by directing other employees. 2.3

(7) Perform or supervise housekeeping chores or stock arrangement, dust and debris control, and other "image-forming" activities. 2.2

ARBORICULTURE OCCUPATIONS

Other Titles: Trainee, Groundman, Climber, Foreman, Superintendent, Manager.

Job Description:

Persons in these occupations transplant, prune, repair, protect, and shape trees and shrubs. They remove unwanted trees and shrubs, remove growth obstructing utility lines, and control brush in utility rights-of-way. Persons in these occupations must be physically strong, mechanically inclined, and have little fear of heights. They usually are employed by private business services, by municipalities, or by utility companies.

Competencies Identified and Validated

N = 131*

	Weighted Means by Occupation**				
Competencies	Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
1. Interview and select prospective employees.	.2	.3	.5	2.5	3.6
a. Interview and select prospective employees.	.2	.3	.5	2.5	3.6
2. Work with customers and prepare estimates and bills.	.4	.7	1.0	2.8	3.5
a. Handle customer or public complaints before and after tree work.	.4	.8	1.3	3.5	3.9
b. Work with tree wardens, police, and representatives of utilities in planning work.	.3	.5	.9	3.0	3.8

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* Competencies for the five occupations are composites of 131 responses from commercial, municipal, utility, and research and extension arborists, in 31 states and Canada. Survey conducted by the Agricultural/Agribusiness/Natural Resources Education Unit, Division of Vocational Education, New Jersey Department of Education, Trenton, New Jersey 08625.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

Competencies	Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
c. Prepare estimates for competitive bidding and private work.	.2	.3	.5	2.1	3.5
d. Prepare bills for work performed.	.2	.3	.4	1.6	3.5
e. Advise property owners of tree work and obtain permission for work.	.4	.9	1.5	3.5	3.5
f. Post signs or distribute circulars announcing future tree work.	.8	1.1	1.1	2.8	2.7
3. Plan work schedules.	.3	.5	1.0	3.3	3.6
a. Prepare daily work assignment sheets.	.2	.4	.8	3.2	3.6
b. Prepare work report forms.	.3	.6	1.2	3.3	3.5
4. Inspect work in progress.	.3	.4	.9	3.3	3.8
a. Check crew production and performance.	.3	.4	.9	3.3	3.8
b. Tie appropriate knots for tree climbing and limb lowering operations.	2.2	2.9	4.0	3.7	2.0
c. Prune trees in accordance with industry standards.	2.0	2.0	4.0	3.7	2.0
d. Handle rope for lowering limbs.	2.5	3.7	3.7	3.5	1.7
e. Operate aerial lift device.	1.5	1.9	3.6	3.6	1.8
f. Position outriggers on aerial lift equipment.	1.7	2.6	3.5	3.6	1.7
g. Hoist tools to climbers using rope and bucket.	2.3	3.6	2.8	3.1	1.3
h. Prune and shear shrubs for form and compactness.	1.6	2.6	2.7	3.0	1.7

Competencies	Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
6. Prevent and control diseases and other tree enemies.	1.3	1.8	2.0	3.0	2.7
a. Disinfect pruning tools to prevent spread of disease.	2.2	2.7	3.2	3.0	1.7
b. Identify insect damage to trees and shrubs, and insect causing damage.	1.1	1.4	2.1	3.3	3.8
c. Identify fruiting body of fungus.	.9	1.1	1.7	2.9	3.5
d. Identify pollution damage to trees.	.8	1.0	1.6	2.8	3.6
e. Identify lightning damage to trees.	1.0	1.2	2.3	3.3	3.6
f. Identify and report girdling roots.	1.0	1.6	2.4	3.2	3.3
g. Mix chemicals for spray applications.	1.1	2.0	2.0	3.6	2.4
h. Select pesticides, fungicides, surfactants, and thickeners for spray operations.	.5	.9	1.1	2.9	3.6
i. Select appropriate nozzles and pump pressures for spray operations.	.6	1.1	1.4	3.3	3.2
j. Determine when conditions are suitable for spray operations.	.5	1.0	1.3	3.6	3.5
k. Check for open windows and doors and cover pools, toys, pet dishes, etc.	1.8	2.7	2.4	3.4	2.1
l. Operate power spray equipment.	1.2	2.2	2.5	3.3	1.6
m. Handle spray hose for spray applicator.	2.1	3.0	2.3	2.6	1.2
n. Clean sprayer and truck after spray operations.	2.4	3.0	2.2	2.5	1.2

Competenciees	Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
o. Dispose of spray containers and excess spray materials in approved manner.	1.7	2.5	2.2	3.2	1.8
7. Practice safe work habits.	1.7	2.4	2.3	3.1	2.5
a. Position and steady ladders for climbers.	2.6	3.4	2.6	3.0	1.3
b. Act as flagman on major traffic arteries.	2.9	3.5	2.4	2.8	1.4
c. Raise kytoons or place signals for aerial spray operations.	1.4	2.1	1.4	2.2	1.1
d. Operate two-way radio.	1.3	2.0	2.2	3.0	2.8
e. Administer first aid.	2.2	3.1	3.3	2.8	3.2
f. Participate in tree accident rescue operations.	2.0	2.9	3.6	3.7	2.8
g. Develop training and safety programs for employees.	.3	.6	1.1	2.8	3.9
h. Fill out accident report forms.	.7	1.0	1.5	3.6	3.6
i. Notify power companies and police of downed wires.	1.3	1.6	2.2	3.6	3.5
j. Place sign and barrier for pedestrian and traffic control.	2.1	3.1	2.5	3.3	1.9
k. Direct and control pedestrian and vehicular traffic in work area.	2.4	3.2	2.2	3.2	1.8
8. Identify trees and shrubs.	1.2	1.6	2.3	3.2	3.6
a. Identify common species of trees for the geographical area.	1.4	2.0	3.0	3.7	3.7
b. Use dichotomous key in the process of identifying uncommon trees.	.9	1.1	1.6	2.7	3.4

Competencies	Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
9. Fertilize trees and shrubs.	1.4	2.0	1.9	2.7	1.8
a. Collect and package soil samples.	1.1	1.5	1.4	2.9	2.5
b. Determine type and amounts of fertilizer required for fertilization of trees and shrubs.	.7	1.0	1.3	2.9	3.3
c. Punch or drill holes in root zone for fertilization.	2.0	2.8	2.4	2.6	1.2
d. Spray soluble fertilizer for foliar feeding of trees.	1.3	2.2	2.2	2.8	1.2
e. Apply fertilizer or lime by hand or spreader.	1.8	2.6	2.1	2.4	1.0
10. Protect trees and shrubs.	1.3	2.0	2.4	2.6	1.4
a. Determine method or type of lightning protection system to be installed.	.5	.8	1.4	2.6	3.1
b. Attach tree air terminals or points and connect down conductors.	.7	1.1	2.7	2.7	1.3
c. Measure and cut cable for lightning protection systems.	1.2	2.0	2.3	2.6	1.2
d. Dig trenches to extend down conductors beyond root area.	1.8	2.5	1.9	1.9	1.0
e. Drive grounding rods into ground.	1.8	2.6	1.9	2.1	1.0
f. Clean, treat and fill cavities in trees above ground level.	1.1	1.6	2.9	3.0	1.4
g. Clean, treat and fill basal cavities at ground level.	1.2	2.3	2.5	2.9	1.4
h. Mix mortar or commercial preparations for filling cavities.	1.7	2.6	2.2	2.5	1.8

Competencies		Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
i.	Brace cavities with bolts or rods.	1.2	2.0	2.9	3.0	1.4
j.	Cut and prepare sheet metal for covering cavities.	1.3	2.2	2.3	2.4	1.2
k.	Drill holes and install drains in cavities as required.	1.2	2.0	2.7	2.7	1.2
l.	Brace or cable established trees above ground level.	1.1	1.5	3.1	3.0	1.4
m.	Measure and cut cable for cabling operations.	1.4	2.0	2.8	2.9	1.3
n.	Insert screw rods for separating parallel branches.	1.4	1.7	3.0	2.8	1.2
o.	Cut pipe for use in covering bracing bolts.	1.4	2.3	2.3	2.4	1.1
p.	Construct stone dry-wells around trees for raising grade.	1.6	2.6	1.9	2.5	1.4
q.	Remove girdling roots with appropriate tools.	1.3	2.1	2.5	2.9	2.1
11.	Transplant trees and shrubs.	1.7	2.6	2.1	2.5	1.3
a.	Root prune trees to be transplanted.	1.5	2.7	2.3	2.8	1.5
b.	Dig and comb soil from roots of trees to be transplanted bareroot.	1.7	2.6	2.0	2.5	1.2
c.	Dig, ball, and burlap trees to be transported.	1.9	2.7	2.3	2.6	1.4
d.	Tie back branches of trees to be transported.	1.9	2.7	2.3	2.6	1.4
e.	Dig holes to receive transplanted trees.	2.2	2.9	2.2	2.3	1.3
f.	Backfill soil around transplanted trees.	2.3	2.9	2.1	2.4	1.2

Competencies		Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
g.	Operate tree spade in transplanting operations.	1.0	2.0	2.0	2.7	1.3
h.	Operate back-hoe in transplanting operations.	.9	2.0	1.8	2.5	1.1
i.	Guy newly transplanted trees.	1.8	2.7	2.4	2.8	1.4
j.	Cut wire and hose or plastic ties for guying purposes.	2.1	2.7	2.6	2.5	1.2
k.	Cut deadman anchors from cedar or locust for guying.	1.7	2.4	1.9	2.1	1.0
l.	Dig trenches for installing deadman anchors.	2.0	2.6	1.8	2.0	1.0
m.	Drive or bury posts or stakes for guying.	2.1	2.7	2.0	2.1	1.1
n.	Operate front-end loader for moving soil in grading operations.	1.1	2.3	1.9	2.5	1.2
o.	Install drainage tiles around tree when grade is raised.	1.5	2.6	2.0	2.6	1.4
p.	Construct wall around tree when grade is lowered.	1.4	2.5	1.8	2.5	1.3
q.	Remove soil with hand or power equipment in grade lowering.	1.6	2.5	1.8	2.3	1.2
r.	Treat, prune, and repair roots damaged in grade lowering or excavation.	1.4	2.5	2.3	2.8	1.5
12.	Fell and dispose of unwanted trees.	1.6	2.8	2.4	2.6	1.3
a.	Fell and cut up trees using power chain saw.	1.7	3.1	3.5	3.4	1.6
b.	Handle ropes for pull-lines and lowering limbs and sections.	2.0	3.5	3.2	3.2	1.5

Competencies	Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
c. Operate tree crane for removing sections in tree removal process.	.8	1.8	2.2	3.0	1.3
d. Operate hydraulic log splitter.	1.3	2.5	1.9	2.3	1.1
e. Operate stump cutter.	1.1	2.5	2.1	2.7	1.3
f. Cut up stumps using power or hand tools.	1.5	2.8	2.2	2.4	1.2
g. Fill depressions resulting from stump removal operations with chips and soil.	2.2	2.9	2.1	2.2	1.2
h. Control brush by application of foliar, basal, dormant stem or stump sprays.	1.4	2.5	2.1	2.8	1.7
i. Feed limbs or brush into chipper.	2.3	3.6	2.7	2.6	1.3
j. Operate grapple loader.	.9	2.0	2.0	2.5	1.1
k. Operate log chipper.	1.0	2.0	1.7	2.1	1.0
l. Load and unload logs from flatbed truck.	1.8	2.8	2.2	2.5	1.2
m. Load limbs and debris on dump truck.	2.5	3.4	2.5	2.5	1.2
n. Drive and operate dump truck for disposal of brush and debris.	2.0	3.2	2.5	2.8	1.3
13. Maintain equipment.	1.6	2.5	2.5	2.9	1.6
a. Inspect, service, and repair aerial lift equipment.	1.0	1.5	2.7	3.4	2.1
b. Submit periodic equipment status reports.	.6	1.1	1.8	3.5	3.4
c. Fuel, service, and replace worn teeth on stump cutter.	1.2	2.3	1.9	2.6	1.3
d. Operate and maintain rotary brush saw.	1.4	2.5	2.1	2.3	1.1

Competencies		Trainee	Groundman	Climber	Foreman	Manager/ Superintendent
e.	Lubricate moving parts and check hydraulic system on power equipment.	1.5	2.7	2.7	3.3	1.5
f.	Inspect, coil, pile, or suspend rope for storage.	1.7	2.8	3.2	3.4	1.6
g.	Refuel gasoline engines.	2.4	3.2	2.7	2.7	1.3
h.	Drain and change oil and filters.	1.7	2.5	2.1	2.4	1.3
i.	Change and repair tires on equipment.	1.6	2.2	1.8	2.1	1.2
j.	Replace and/or repair chains on chain saw.	1.6	2.8	3.0	3.3	1.5
k.	Sharpen blades for chain or hand saws.	1.4	2.6	3.1	3.2	1.5
l.	Keep tool storage area on truck clean and orderly.	2.5	3.2	3.0	3.1	1.5

FLORICULTURE - DELIVERY PERSON

Other Titles: Driver

Job Description:

A Floral Delivery Person is responsible for prompt, reliable delivery service of floral arrangements and plant materials to the customer. His or her duties include: taking customer orders, making sales transactions, and guaranteeing careful handling of floral pieces and plants. He or she is responsible for operating and maintaining the delivery vehicle (safety and repair). This occupation is often seasonal or part-time, depending on the size of the business operation.

Competencies Identified and Validated

N = 36*

Competencies	Weighted Mean**
1. Communication skills.	3.1
a. Exhibit courteous, considerate, and respectful conduct.	3.7
b. Present a clean, conscientious, neat appearance.	3.6
c. Listen effectively, write clearly, and speak effectively in customer relations.	3.4
d. Understand customer's problems and handle complaints with tact.	3.2
e. Keep accurate records.	2.8
f. Make decisions concerning business dealings when necessary and make evaluations of various business endeavors.	1.5
2. Business management.	3.2
a. Be a licensed driver.	4.0
b. Be familiar with customer territory and be capable of successful use of a road map.	3.7
c. Properly plan and execute delivery route with economy and efficiency (gas mileage and time).	3.6
d. Practice courtesy in social and business situations.	3.5
e. Package, label, and review orders for correct delivery (timing/location).	3.5

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* Responses from 36 Floral Delivery Persons in 25 states. Survey conducted by Department of Agricultural Education, University of Rhode Island, Kingston, Rhode Island 02881.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

f.	Make accurate sales transactions and give receipts properly.	2.1
g.	Know price range of flowers and plants.	1.9
h.	Load a delivery truck in proper sequence for delivery, as well as using methods that avoid damage to flowers and plants.#	
3.	Floriculture skills.	2.7
a.	Avoid travel damage; capable of minor adjustments before delivery, and know where and when to leave an arrangement.	3.6
b.	Able to identify possible mistakes in an order.	2.9
c.	Know basic plant identification.	2.2
d.	Advise customers on basic plant care (water, light, temperature) and placement of arrangements when asked.	2.1
e.	Avoid freezing or heat damage to flowers and plants being delivered.#	
f.	Can effectively pick up incoming shipments and prepare live plant material for storage and/or display.#	
4.	Auto/mechanical skills.	3.2
a.	Operate vehicle safely and cautiously.	3.9
b.	Know when to contact mechanic (major repairs).	3.1
c.	Operate, maintain, and make minor repairs on the service vehicle.	2.5
d.	Clean and wash the delivery vehicle.#	

# Not included in questionnaire but recommended by some experts surveyed.

FLORICULTURE - SALESPERSON

Other Titles: Designer, Delivery Person, Florist Assistant.

Job Description:

A salesperson deals with people, goods, and services. He or she must have a knowledge and understanding of available plant materials, supplies, and accessories in the shop. His or her duties include advising and recommending arrangements to the customer, demonstrating various floral products, and explaining price differences. He or she must tactfully handle customer requests and complaints, prepare window displays, maintain a clean and appealing showroom, and should understand basic business principles. In a small flower shop this person may also serve as a designer and/or delivery person.

Competencies Identified and Validated

N = 30*

Competencies	Weighted Mean**
1. Communication skills.	3.7
a. Conduct self in a courteous, considerate, and concerned manner.	3.9
b. Be sincere and demonstrate concern in meeting customer needs and interests.	3.8
c. Acquire customer as well as business associates' respect and present a clean, conscientious appearance.	3.7
d. Speak and listen effectively and write clearly.	3.6
e. Handle customer complaints and problems with patience, understanding, and tact.	3.4
2. Business management.	3.2
a. Take orders correctly and be flexible in adjusting or altering items to the customer's specifications.	3.7
b. Advise customers about materials and services available.	3.5
c. Make accurate sales and credit card transactions and keep precise records.	3.5

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* Responses from 30 Floriculture Sales Personnel in 26 states. Survey conducted by Department of Agricultural Education, University of Rhode Island, Kingston, Rhode Island 02881.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

d.	Understand national and world wide floral delivery procedures.	3.4
e.	Maintain an attractive showroom and clean work area.	3.3
f.	Understand shop pricing policy and practices.	3.3
g.	Assist with advertising and promotional information.	2.0
h.	Be familiar with delivery routes, time schedule and delivery policies.#	
3.	Floriculture (task-oriented) skills.	3.2
a.	Know flowers, plants, supplies, and accessories and their availability.	3.6
b.	Know plant requirements (water, light, temperature) and also "special use" plants and flowers (shade, sun, dry, wet, long/short lived).	3.4
c.	Give advice to customers on proper plant care and handling, seasonal availability, and price fluctuations.	3.3
d.	Understand principles of floral design and color.	3.3
e.	Know basic designs and approximate time it takes to make specific items (for customer information).	3.0
f.	Responsible for immediate care such as watering, potting, transplanting, cutting, and reconditioning.	2.7
g.	Know how to receive a shipment of cut flowers and/or plants and how to process them for storage and/or display.#	
h.	Be able to wrap or package floral designs and plants for carrying by customers and for delivery.#	

# Not included on questionnaire but recommended by some experts surveyed.

FLORICULTURE - FLORAL DESIGNER

Other Titles: Floral Artist, Floral Arranger, Florist, Designer, Design Coordinator.

Job Description:

A floral designer is a person trained in the art of flower arranging and the principles of design and color. The work consists of making floral pieces ranging from corsages to wedding bouquets; wreaths; sprays; funeral designs; birthdays; holidays; and other special occasions. A floral designer is creative and flexible. He or she must be capable of interpreting customer requests (either pictorial or verbal descriptions of the desired arrangement) and filling the customer's order. He or she should be able to identify and use all the appropriate flowers, tools, and supplies correctly as well as decide the kind and amount of materials needed to satisfy customer tastes and desires. In a small retail flower shop this person may also have sales and delivery duties as well.

Competencies Identified and Validated

N = 42*

Competencies		Weighted Mean**
1.	Leadership and communication skills.	3.4
a.	Write clearly and be able to interpret customer orders correctly.	3.8
b.	Listen and speak effectively.	3.6
c.	Present a clean, conscientious, and friendly appearance.	3.5
d.	Conduct one's self in a considerate and concerned manner in social and business situations.	3.4
e.	Handle complaints and problems with tact and understanding.	3.3
f.	Plan and organize a work schedule.	3.1
g.	Make decisions and evaluate results.	3.1
2.	Business management skills.	3.4
a.	Understand pricing policy and be able to make price/cost determinations.	3.6

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* Responses from 42 Floral Designers in 30 states. Survey conducted by Department of Agricultural Education, University of Rhode Island, Kingston, Rhode Island 02881.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

b.	Operate cash register, make change for sales transactions, and know how to process charge card sales.	3.5
c.	Understand national and world wide floral delivery procedures.	3.4
d.	Advise and recommend products and services to meet customer needs.	3.3
e.	Keep accurate records.	3.2
f.	Be familiar with delivery routes, time schedules, and delivery policies.#	
3.	Floriculture task-oriented skills.	3.5
a.	Estimate cost of the arrangement.	3.7
b.	Know the names of flowers and their seasonal availability.	3.6
c.	Understand flower and foliage requirements for water, light, temperature, etc.	3.4
d.	Be capable of preparation work such as hardening off preservation, wiring, etc.	3.4
e.	Determine the kind and amount of flowers, foliage, and accessories needed to meet customer's tastes and desires.	3.4
f.	Create all the basic floral designs (e.g., Hogarth curve, inverted T, L arrangements, etc.).	3.3
g.	Be capable of making and executing plans for interior decoration schemes for weddings, dinners, parties, etc.#	

Not included in questionnaire but recommended by some experts surveyed.

FLORICULTURE - GREENHOUSE FOREMAN

Other Titles: Grower, Crew Leader.

Job Description:

A greenhouse foreman is responsible for the proper care of all greenhouse facilities assigned to him in his area of the greenhouse range and understands the principles and practices of plant cultivation, propagation, and protection. He or she can identify the plants grown and their problems (diseases, pests, and others). Manages all greenhouse personnel under their direction; supervises their activities and trains them in the appropriate techniques for the crops being grown. He or she is often responsible for planning the cropping schedule for their section of the greenhouse range.

Competencies Identified and Validated

N = 19*

Competencies		Weighted Mean**
1.	Communication skills.	3.2
a.	Plan and organize work schedules and keep accurate records.	3.6
b.	Make decisions, evaluate results, earn respect, and promote harmony among workers.	3.5
c.	Understand people and their problems and handle complaints with tact.	3.1
d.	Exercise consideration and fairness with respect to job assignments and leadership.	3.1
e.	Hire and train employees.	2.9
f.	Present a clean, conscientious, and respectable appearance.	2.8
g.	Accept direction from the manager.#	
2.	Floriculture (plant and soil science) task-oriented skills.	3.3
a.	Identify and control insects, diseases, and other pests through correct application of pesticides.	3.8
b.	Recognize requirements and deficiencies (environmental and nutritional) and correct through the use of greenhouse management practices (fertilizer, lime, water, etc.).	3.6

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* Responses from 19 Greenhouse Foremen in 19 states. Survey conducted by Department of Agricultural Education, University of Rhode Island, Kingston, Rhode Island 02881.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

Not included in questionnaire but recommended by some experts surveyed.

c.	Perform and demonstrate planting, potting, transplanting, picking, pinching, and pruning techniques.	3.5
d.	Prepare soils properly for seeding, planting, or transplanting including soil sampling and testing; mixing, modifying, and conditioning with amendments.	3.4
e.	Know the names of all plants being grown and cultural requirements of the various plant species.	3.4
f.	Have a knowledge of agricultural and chemical regulations concerning pesticide use.	3.4
g.	Understand plant and soil science technology.	3.3
h.	Propagate plants by seeds, cuttings, etc.	3.2
i.	Cut, recondition, and harvest plants.	3.1
j.	Be commercially certified in pesticide application.	2.8
k.	Perform appropriate harvesting, grading, and packing of cut flowers and potted plants in preparation for marketing.#	
3.	Management and mechanical skills.	2.6
a.	Operate pesticide application equipment correctly and safely (e.g., fumigators, sprayers.).	3.3
b.	Maintain operation of heating, watering, lighting, ventilation, and air conditioning systems.	2.9
c.	Operate, maintain, and repair needed machinery (e.g., roto-tiller, tractor, concrete mixer, etc.).	2.3
d.	Be proficient in construction of utility buildings, etc.	1.8
e.	Plan and maintain all crop, operation and maintenance schedules.#	

# Not included in questionnaire but recommended by some experts surveyed.

FLORICULTURE - FLOWER SHOP MANAGER

Other Titles: Retail Florist.

Job Description:

The flower shop manager directs all operations and supervises personnel. He or she must be knowledgeable in business management, and be able to communicate effectively with the flower shop personnel. The manager must be able to plan and execute sales strategies, exert strong control of inventories, especially of fresh materials. He or she must also be able to plan a budget and operate within it. The ability to direct group efforts is essential.

Competencies Identified and Validated

N = 24*

Competencies		Weighted Mean**
1.	Education and experience.	2.4
a.	Knowledge of floriculture gained through "supervised" work experience in retail floriculture.	3.4
b.	Informal training.	2.9
c.	Formal training (secondary/post secondary school) in floriculture and business management.	2.4
d.	Credits in floriculture/greenhouse management.	2.0
e.	College degree.	1.4
2.	Leadership and communication skills.	3.6
a.	Able to describe, discuss, and demonstrate tasks and responsibilities to employees effectively.	3.8
b.	Be courteous, considerate, and respectful.	3.7
c.	Understand customer/employee relations and promote a harmonious atmosphere.	3.7
d.	Able to handle customer/employee needs and complaints tactfully.	3.7
e.	Plan, organize, and direct work schedules.	3.6
f.	Have a clean, neat appearance.	3.4
g.	Possess effective "people" skills.	3.4
h.	Speak clearly and effectively.	3.4

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* Responses from 24 Floriculture Shop Managers in 21 states. Survey conducted by Department of Agricultural Education, University of Rhode Island, Kingston, Rhode Island 02881.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

3.	Business management.	3.1
a.	Determine prices and pricing policy.	3.6
b.	Be able to buy and use flowers and supplies in such a way as to maintain a balanced inventory with small waste.	3.5
c.	Supervise sales and workroom operations.	3.5
d.	Keep accurate records and use credit properly.	3.4
e.	Capable of training employees.	3.4
f.	Understand and practice effective business procedures.	3.2
g.	Make job estimates accurately.	3.1
h.	Understand insurance and licensing regulations for local, state, and federal governments.	2.8
i.	Have experience in advertising and promotional sales techniques.	2.6
j.	Prepare tax returns, accounting and Social Security records, and understand bookkeeping.	2.3
4.	Floriculture.	2.8
a.	Capable of performing employee's tasks.	3.2
b.	Understand cultural requirements of plants.	2.9
c.	Know the names of all plants and plant materials sold by the shop, their propagation and culture.	2.9
d.	Know operation and techniques of greenhouse management including handling and storage of cut flowers and "greens".	2.6
e.	Understand operation of various greenhouse and shop machinery.	2.4
f.	Possess a high degree of floral design skill.#	

Not included in questionnaire but recommended by some experts surveyed.

GREENHOUSE WORKER

Other Titles: Greenhouse Employee, Laborer.

Job Description:

The Greenhouse Worker assists in growing plants in greenhouse operations. The greenhouse worker is involved with the planting, growth, and harvesting of greenhouse plants for sale directly to the public or to other retail outlets. The greenhouse worker may be involved with either vegetable or flower production. The specific duties performed by the greenhouse worker will depend on the type and size of greenhouse operation. In general, the greenhouse worker usually mixes and prepares the growing medium, sows seeds, starts cuttings, and transplants plants and seedlings; waters, thins, and weeds plants; controls insects and diseases; regulates the greenhouse environment, maintains tools and equipment, and cuts or harvests greenhouse plants.

Competencies Identified and Validated

N = 32*

Competencies	Weighted Mean**
1. Perform general office work.	1.7
a. Meet various people.	2.1
b. Use telephone.	2.1
c. File office forms and records.	1.3
d. Schedule appointments.	1.1
2. Record information.	2.9
a. Record greenhouse crop production information.	3.1
b. Record equipment maintenance information.	2.7
3. Maintain facilities.	1.5
a. Sweep work area floors.	1.5
4. Follow safety practices in greenhouse production.	2.7
a. Follow safe work habits.	3.7
b. Identify potential safety hazards.	3.5
c. Store chemicals.	3.5
d. Interpret information on labels and signs.	3.5
e. Dispose of chemical containers.	3.4
f. Wear appropriate protective clothing.	3.3

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* Responses from 32 Greenhouse Workers in 20 states. Survey conducted by Program Director of Vocational Agriculture and Renewable Natural Resources Education, Division of Vocational-Technical Education, Old Capitol Building, Olympia, Washington 98504.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

g.	Ventilate work areas.	3.3
h.	Use proper lifting and carrying methods.	3.3
i.	Store inflammable materials.	3.2
j.	Remove debris from work areas.	3.2
k.	Use fire extinguishers.	3.1
l.	Wear appropriate work clothes.	3.1
m.	Adjust safety devices.	2.9
n.	Correct potential safety hazards.	2.7
o.	Use electrical connectors and safety devices.	2.7
p.	Install safety devices.	2.4
5.	Sell and market greenhouse plants.	2.0
a.	Label merchandise.	2.8
b.	Interpret plant care instructions.	2.7
c.	Complete sales slip.	2.6
d.	Describe items to customers.	2.6
e.	Greet customers.	2.5
f.	Determine whether specific plants requested by customers are in stock.	2.4
g.	Determine when merchandise is to be delivered.	2.3
h.	Receive customer orders by telephone.	2.3
i.	Close a sale.	2.2
j.	Make change.	2.1
k.	Price various items for customers.	2.1
l.	Handle customer complaints and objections.	2.1
m.	Identify seasonal items.	2.0
n.	Determine what customer is describing.	1.9
o.	Operate cash register.	1.9
p.	Make in-store sales contacts.	1.8
q.	Follow-up sales.	1.8
r.	Use billing machine.	1.3
s.	Use sales catalogs.	1.3
t.	Prepare advertisements.	1.0
6.	Store and warehouse greenhouse plants.	2.7
a.	Remove dead and diseased blooms and plant parts from storage.	3.3
b.	Use pot plant sleeving device to wrap potted plants.	2.7
c.	Rotate stock in storage areas.	2.8
d.	Use appropriate materials for packaging.	2.8
e.	Evaluate influence improper storage has on product quality.	2.7
f.	Box or crate large plants.	2.6
g.	Pack plants in fiberboard cartons.	2.5
h.	Place cut flowers in environmental storage.	2.4
i.	Pack cut flowers.	1.9
7.	Maintain greenhouse operations equipment and vehicles.	2.3
a.	Clean debris from equipment.	3.0
b.	Add oil to equipment.	2.8
c.	Inflate tires.	2.7

d.	Grease equipment.	2.5
e.	Interpret general maintenance instructions in equipment operator's manual.	2.3
f.	Add coolant to radiators.	2.2
g.	Change oil and oil filters.	2.2
h.	Inspect cooling system on vehicles for leaks.	2.2
i.	Install and adjust belts.	2.2
j.	Remove equipment from storage.	2.1
k.	Service air cleaners.	2.1
l.	Install and service battery.	1.9
m.	Prepare equipment for storage.	1.8
8.	Use and maintain hand and power tools.	2.9
a.	Use hand tools safely.	3.4
b.	Use power tools safely.	3.4
c.	Clean tools.	3.0
d.	Select tools for specific jobs.	3.0
e.	Store tools.	3.0
f.	Identify tools.	2.8
g.	Interpret tool operation instructions.	2.8
h.	Sharpen tools.	2.7
i.	Adjust tools.	2.6
j.	Recondition tools.	2.0
9.	Test soil and plant tissues.	2.0
a.	Prepare soil to be submitted to testing laboratory.	2.3
b.	Interpret soil test results.	2.2
c.	Take representative soil samples.	2.2
d.	Prepare forms to submit with soil samples.	2.0
e.	Use parable kits to determine soil pH.	1.9
f.	Prepare plant tissues to be submitted to testing laboratory.	1.8
g.	Interpret plant tissue test results.	1.7
h.	Prepare forms to submit with plant tissue.	1.7
10.	Fertilize plants in greenhouse operations.	2.7
a.	Apply fertilizer in liquid form.	3.2
b.	Interpret labels on fertilizer bags.	3.1
c.	Use fertilizer injectors.	3.0
d.	Interpret manufacturer's fertilization rate charts.	2.9
e.	Apply dry fertilizer.	2.8
f.	Mix fertilizer solutions.	2.8
g.	Identify nutrient deficiency symptoms in growing plants.	2.8
h.	Determine kind of fertilizer and lime to apply.	2.5
i.	Determine when to apply fertilizer and pH adjustment materials.	2.5
j.	Evaluate influence various nutrients have on plant growth.	2.5

k.	Determine the nutrient requirements of various plants.	2.5
l.	Determine amount of fertilizer and lime to apply.	2.4
m.	Differentiate between organic and inorganic fertilizers.	2.3
n.	Determine costs of fertilizers.	1.8
11.	Operate equipment and vehicles.	2.5
a.	Use appropriate equipment and vehicles for specific jobs.	3.1
b.	Interpret safety symbols on equipment.	3.0
c.	Interpret gauge readings.	2.8
d.	Refuel power units.	2.8
e.	Correct potential equipment safety hazards.	2.7
f.	Identify equipment safety hazards.	2.7
g.	Interpret safety instructions in operator's manual.	2.7
h.	Interpret hand operating signals.	2.5
i.	Operate equipment and vehicles on public highways.	2.4
j.	Adjust equipment safety shields.	2.4
k.	Hitch towed equipment.	2.2
l.	Operate equipment under work conditions.	2.2
m.	Connect front end operated equipment.	1.9
n.	Connect hydraulic systems and hydraulic operated equipment.	1.9
12.	Control insects and diseases in the greenhouse and field.	3.0
a.	Use appropriate method to apply chemicals.	3.5
b.	Mix chemicals with appropriate carrier.	3.4
c.	Identify common insects.	3.4
d.	Apply chemicals in liquid form.	3.3
e.	Identify common diseases.	3.3
f.	Identify damage caused by insects and diseases.	3.3
g.	Select appropriate chemicals to control various insect pests and diseases.	3.3
h.	Inspect greenhouse crops to determine when infestations require control.	3.3
i.	Identify various means by which diseases and pests are spread.	3.1
j.	Determine amount of chemical to apply.	3.0
k.	Determine when to apply chemicals.	2.9
l.	Apply chemicals in dust form.	2.9
m.	Evaluate influence of diseases and pests on greenhouse productions.	2.8
n.	Evaluate influence of temperature, light, and humidity on disease and insect problems.	2.8
o.	Evaluate life cycle of insects to determine appropriate control procedures.	2.8
p.	Apply chemicals in aerosol bombs.	2.7

q.	Identify disease and insect resistant varieties for planting.	2.4
r.	Apply chemicals through steam systems.	1.9
13.	Control weeds in the greenhouse and field.	2.7
a.	Mix chemicals.	3.2
b.	Use appropriate method to apply chemicals.	3.0
c.	Apply chemicals to control weeds.	3.0
d.	Inspect greenhouse crops to determine when weeds require control.	2.9
e.	Determine amount of chemical to apply.	2.8
f.	Determine when to apply chemical.	2.7
g.	Evaluate influence weeds have on greenhouse crops.	2.6
h.	Identify common weeds.	2.6
i.	Select appropriate method to control weeds.	2.6
j.	Use mechanical tools to remove weeds.	2.6
14.	Prepare the greenhouse growing medium.	2.7
a.	Fill benches and pots.	3.1
b.	Identify greenhouse soil materials.	3.1
c.	Fill soil bins.	3.0
d.	Mix soil with appropriate plant growing materials.	3.0
e.	Shred or screen soil.	2.8
f.	Steam soil.	2.8
g.	Determine appropriate soil mix for specific plants.	2.7
h.	Determine soil texture.	2.7
i.	Spread peat moss.	2.7
j.	Mark soil for planting.	2.6
k.	Level soil surface.	2.5
l.	Prepare compost.	2.4
m.	Sterilize and heat mixed soils with chemicals.	2.2
n.	Evaluate physical, chemical, and biological effects steam has on soil.	2.1
15.	Establish greenhouse plants.	2.4
a.	Water the soil.	3.4
b.	Determine proper planting depth.	3.3
c.	Use rooting hormones with cuttings.	3.2
d.	Mist cuttings.	3.1
e.	Prune plants.	3.1
f.	Identify problems related to propagation failures.	3.1
g.	Use appropriate planting method.	3.0
h.	Transplant seedlings.	3.0
i.	Grade cutting for size.	3.0
j.	Disbud plants.	3.0
k.	Determine soil temperatures.	2.9
l.	Force bulbs.	2.9
m.	Identify various plants.	2.9

n.	Place cuttings in flats.	2.9
o.	Remove cuttings from propagation benches.	2.9
p.	Determine air temperature.	2.8
q.	Determine proper time to plant.	2.8
r.	Make stem cuttings for appropriate plants.	2.8
s.	Place cuttings in rows.	2.8
t.	Tie plants.	2.8
u.	Determine planting rates for various varieties.	2.7
v.	Make leaf cuttings for appropriate plants.	2.7
w.	Pencil label planted specimens.	2.7
x.	Select cuttings and seeding stock.	2.7
y.	Determine number of cuttings to include in a pot.	2.6
z.	Interpret information on seed or bulb tags.	2.6
aa.	Select appropriate seeds and bulbs.	2.6
bb.	Cultivate beds.	2.5
cc.	Evaluate influence "poor" seed or bulb has on germination.	2.5
dd.	Sow seed for greenhouse stock.	2.5
ee.	Thin seedlings.	2.5
ff.	Determine percent germination.	2.3
gg.	Clean seeds.	2.1
hh.	Inoculate seeds.	1.7
ii.	Make an approach graft.	1.4
jj.	Graft cacti.	1.1
kk.	Make a bark graft.	1.1
ll.	Make a machine graft.	1.1
mm.	Make a patch-bud graft.	1.1
nn.	Make a saddle graft.	1.1
oo.	Make a splice graft.	1.1
pp.	Make a T-bud graft.	1.1
qq.	Make a whip-and-tongue graft.	1.1
16.	Construct and maintain greenhouse buildings and structures.	2.3
a.	Replace window panes.	2.8
b.	Replace plastic covering on temporary greenhouses.	2.8
c.	Apply wood and metal preservatives.	2.7
d.	Replace belts and pulleys.	2.6
e.	Reset circuit breakers.	2.6
f.	Replace fuses.	2.6
g.	Replace valves in water lines.	2.6
h.	Replace or repair water faucets.	2.6
i.	Wash greenhouse glass.	2.6
j.	Construct and repair benches and frames.	2.6
k.	Clean heating and cooling systems.	2.5
l.	Replace water pipes.	2.5
m.	Clean and oil electric motors.	2.4
n.	Repair minor leaks in roof of buildings.	2.4
o.	Replace lighting fixtures.	2.4
p.	Replace traps in heating system and water line.	2.3

q.	Replace electrical switches.	2.2
r.	Repair electrical cords and wires.	2.2
s.	Wire simple electrical circuit.	2.1
t.	Install electrical motors.	2.0
u.	Construct and remove concrete forms.	1.9
v.	Hang and repair doors.	1.9
w.	Develop bill of materials needed for repairs.	1.8
x.	Pour, finish, and cure concrete.	1.8
y.	Repair bracing in buildings.	1.8
z.	Determine cost of repairs needed.	1.7
aa.	Lay concrete block.	1.6
bb.	Make minor repairs on metal quonset superstructure.	1.6
cc.	Read and interpret blueprints.	1.6
17.	Assemble and install greenhouse equipment and structures.	2.8
a.	Water greenhouse plants.	3.7
b.	Control air temperature.	3.1
c.	Control humidity.	3.1
d.	Alter spacing of plants.	3.0
e.	Apply shading compound to glass.	3.0
f.	Control light quantity and quality.	3.0
g.	Mist plants.	3.0
h.	Evaluate affect temperature has on plants.	2.9
i.	Determine appropriate temperatures for various plants.	2.9
j.	Evaluate influence relative humidity has on plant growth.	2.8
k.	Hand cloth or saran cloth.	2.8
l.	Set automatic water timers.	2.8
m.	Wet greenhouse walks.	2.8
n.	Interpret light meters.	2.5
o.	Basin plants for watering.	2.4
p.	Temper water.	2.2
q.	Regulate carbon dioxide generating equipment.	2.1
18.	Harvest greenhouse plants.	2.9
a.	Determine when various plants should be cut or removed.	3.4
b.	Grade plants as to quality and uniformity.	3.3
c.	Observe plants to determine stages of bloom.	3.2
d.	Evaluate the influence stage of maturity has on quality and value of plant.	3.1
e.	Assemble orders.	3.1
f.	Weed and tag plant materials for orders.	3.0
g.	Label harvested plants by common name.	2.9
h.	Load materials into cars or trucks.	2.8
i.	Determine whether various flower plants are to be marketed as pots, baskets, or as individual flowers.	2.8
j.	Dig plant materials.	2.1
k.	Ball plant materials.	2.0

GROUNDS SUPERVISOR

Job Description:

Grounds Supervisors are responsible to the grounds superintendent for maintenance and upkeep of grounds surrounding structures of an industry or business, school, hospital, private estate, municipal park, airport, cemetery, or any other enterprise or establishment with a sizable amount of grounds to care for. They organize and direct the work of "grounds workers" of "assistant groundskeepers" and maintain records and prepare reports concerning maintenance activities. They must be capable of translating blueprints and plans prepared by the landscape architect into reality, and may develop and carry out landscape plans of their own. They must know cultural requirements of all types of plant material; be capable of operating and maintaining groundskeeping equipment; and be able to design, construct, and maintain concrete, wood, and metal landscape structures and conveniences. Post-high school technical training is generally required for entry into the position.

Competencies Identified and Validated

N = 36*

Competencies	Weighted Mean**
1. Organize jobs and supervise workers.	3.3
a. Demonstrate and instruct employees in their tasks.	3.7
b. Enforce safety regulations.	3.5
c. Prepare daily work plans.	3.3
d. Evaluate performance of workers.	3.1
e. Confer with workers concerning problems and performance.	3.1
f. Acquire equipment and plant materials.	2.8
2. Maintain records and make reports.	3.1
3. Read blueprints and plans.	2.9
4. Prepare planting schedules.	2.6
5. Establish, renovate, and maintain turf and lawns.	2.9
a. Determine mowing schedules.	3.3
b. Determine watering rates and schedules.	3.2

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* Responses from 36 Grounds Maintenance Personnel in 23 states. Survey conducted by Division of Resource Management, Agricultural Education, West Virginia University, Morgantown, West Virginia 26505.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

c.	Identify weeds, insects, and diseases in turf.	3.0
d.	Control weeds, insects, and diseases in turf and lawns.	2.9
e.	Select and apply fertilizers and lime according to soil requirements.	2.9
f.	Take soil samples for testing.	2.9
g.	Determine seedbed preparation methods.	2.8
h.	Control erosion on newly planted area.	2.8
i.	Grade lawns.	2.7
j.	Determine planting method (sodding, sprigging, and/or seeding).	2.7
k.	Identify and select grasses.	2.6
6.	Plant and maintain ornamental plantings.	2.6
a.	Identify various landscape plants.	3.1
b.	Recognize environmental requirements of trees, shrubs, flowers, vines, and other plant materials.	3.1
c.	Protect plants from insects, diseases, and rodent damage.	3.0
d.	Determine watering rates and schedules.	2.9
e.	Select and apply fertilizers and soil amendments.	2.9
f.	Trim and prune trees and shrubs.	2.9
g.	Cultivate and mulch.	2.8
h.	Determine spacing and depth of planting.	2.7
i.	Transplant ball and burlap plants.	2.7
j.	Prepare planting area.	2.7
k.	Determine planting dates.	2.6
l.	Brace and repair trees.	2.6
m.	Transplant bare root plants.	2.5
n.	Dig and plant bulbs.	2.4
o.	Provide winter protection.	2.3
p.	Train espalier trees and shrubs.	2.1
q.	Propagate plants by cuttings, layering, and division.	1.5
r.	Plant seeds.	1.5
7.	Select, use, and maintain hand tools and equipment.	3.3
8.	Operate and maintain power-operated grounds maintenance equipment.	2.4
a.	Operate, adjust, and service fertilizer spreaders.	3.0
b.	Operate, adjust, and service sprayers.	2.9
c.	Operate, adjust, and service tillers and cultivators.	2.8
d.	Operate, adjust, and service seeders.	2.8
e.	Operate, adjust, and service garden tractors.	2.7
f.	Operate, adjust, and service lawn sweeps.	2.7
g.	Operate, adjust, and service lawn mowers.	2.7
h.	Operate, adjust, and service hedge shears.	2.6

i.	Operate, adjust, and service tractors.	2.6
j.	Operate, adjust, and service chain saws.	2.4
k.	Operate, adjust, and service dusters.	2.3
l.	Operate, adjust, and service leaf collectors.	2.0
m.	Operate, adjust, and service trucks.	2.0
n.	Operate, adjust, and service back hoes.	1.8
o.	Operate, adjust, and service spreader equipment for chemical snow removal.	1.6
p.	Operate, adjust, and service cherry pickers.	1.4
9.	Construct, maintain, and/or install landscape items.	2.4
a.	Install drainage systems.	2.6
b.	Construct and maintain fences.	2.5
c.	Construct and maintain steps, walks, and drives.	2.5
d.	Construct and maintain terraces and patios.	2.5
e.	Construct and maintain retaining and free-standing walls.	2.4
f.	Construct and maintain benches and garden furniture.	2.4
g.	Install irrigation systems.	2.4
h.	Construct and maintain garden pools and streams.	2.3
i.	Install steel or wood curbing.	2.0
j.	Install sculpture, statuary, and fountains.	1.7

CREW FOREMAN - LANDSCAPE PLANTER

Job Description:

Crew Foremen are responsible for supervising crews of landscape workers efficiently and in harmony. They must be able to translate blueprints prepared by the landscape architect or planner into a workable site layout and plan. They must know and be able to teach their crew members grading techniques, soil preparation procedures, and planting methods for trees, shrubs, vines, flowers, and grasses. Supervising layout and construction of sidewalks, driveways, fountains, patios, and formal garden plans may also be part of their job. To become a crew foreman, completion of a post-high school technical course or several years of on-the-job training will probably be required.

Competencies Identified and Validated

N = 29*

Competencies	Weighted Mean**
1. Organize jobs and supervise workers.	3.1
a. Demonstrate and instruct employees in their tasks.	3.7
b. Confer with management regarding workers, work conditions, and plans.	3.5
c. Prepare daily work plans.	3.1
d. Confer with workers regarding problems and performance.	3.0
e. Evaluate performance of workers.	3.0
f. Acquire equipment and plant materials.	2.5
2. Maintain records and make reports.	3.4
3. Analyze and prepare the landscape area.	2.5
a. Read blueprints and plans.	3.5
b. Lay out the landscape plan.	3.2
c. Survey and grade the site.	2.4
d. Install drainage systems.	2.3
e. Develop a working site plan.	2.0
f. Determine drainage needs.	2.0
g. Install irrigation systems.	1.4
4. Plant trees, shrubs, groundcovers, and flowers.	2.6

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* Responses from 29 Landscape Contractors in 17 states. Survey conducted by Division of Resource Management, Agricultural Education, West Virginia University, Morgantown, West Virginia 26506.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

a.	Identify various landscape plants.	3.4
b.	Prepare planting site.	3.4
c.	Plant ball and burlap and container grown stock.	3.3
d.	Prune and trim newly planted trees and shrubs.	3.3
e.	Determine spacing and depth of planting.	3.0
f.	Plant bare root plants.	3.0
g.	Select and apply mulching materials.	2.9
h.	Determine methods and techniques of supporting plants.	2.5
i.	Plant seeds and bulbs.	2.4
j.	Determine fertilizer and soil amendment types and rates of application.	2.0
k.	Determine watering schedules and rates.	1.9
l.	Determine planting dates.	1.9
m.	Plant cuttings.	1.8
n.	Protect plants from rodent damage.	1.4
5.	Establish and renovate turf and lawns.	1.7
a.	Determine soil preparation methods.	2.2
b.	Determine planting methods.	2.0
c.	Identify and select grasses.	1.7
d.	Determine seeding and springing rates and methods.	1.7
e.	Determine methods of rolling areas planted by seeding, stolons, and sodding.	1.7
f.	Determine watering rates and schedules.	1.7
g.	Determine erosion control needs and methods.	1.6
h.	Determine type and amount of mulching required.	1.6
i.	Sterilize soil to eliminate pests.	1.6
j.	Determine planting dates.	1.5
k.	Determine fertilizer, lime, and soil amendment types, rates, and method of application.	1.5
l.	Collect soil samples and interpret test results.	1.0
6.	Layout and construct or install landscape structures and conveniences.	2.3
a.	Layout and construct walks, drives, and patios.	2.5
b.	Layout and build retaining and free standing walls.	2.4
c.	Layout and construct steps and ramps.	2.3
d.	Layout and construct fences.	2.2
e.	Layout and install fountains and pools.	2.1
f.	Construct benches and garden furniture.	2.0

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j.	Thin seedlings.	2.4
k.	Harvest, extract, clean, dry, and store seed.	2.3
4.	Propagate by vegetative means.	2.9
a.	Select and collect plant materials for reproduction.	3.4
b.	Prepare stem, leaf, and/or root cuttings.	3.2
c.	Label rows or areas.	3.1
d.	Select and use tools, equipment, waxes, hormones, and other materials used in vegetative reproduction.	3.0
e.	Bud and/or graft scions (cions) to seedling stock.	2.8
f.	Transplant to pots or field.	2.5
g.	Propagate plants by division and/or separation.	2.4
h.	Reproduce plants by layering.	2.3
5.	Control plant environment.	3.0
a.	Determine water requirements and schedule.	3.5
b.	Control temperature and humidity levels in the greenhouse.	3.2
c.	Determine spacing of plants.	3.1
d.	Determine fertilizer types and rates of application.	3.0
e.	Select, install, and operate mist system propagation benches.	2.9
f.	Select weed, disease, and insect control measures.	2.7
g.	Construct and use hotbeds and coldframes.	2.6

GROUNDS WORKER

Other Titles: Assistant Groundskeeper.

Job Description:

Grounds Workers work under the direction of grounds supervisors in caring for the area surrounding structures of an industry or business, school, hospital, private estate, cemetery, municipal park, airport, or any other enterprise or establishment with a sizable amount of grounds to care for. They plant and care for turf, groundcover, shrubs and trees, as well as for annuals and perennials. They operate, maintain, and service hand and power operated groundskeeping equipment. Year-round employment is provided through construction, maintenance, and repair of walks, drives, equipment, and conveniences. Completion of a high school education with training in ornamental horticulture is highly desirable for entry into this job.

Competencies Identified and Validated

N = 38*

Competencies	Weighted Mean**
1. Establish, renovate, and care for turf and lawns.	2.9
a. Plant grasses by sodding, sprigging, and/or seeding.	3.5
b. Mow lawns.	3.5
c. Apply lime and fertilizer to lawns.	3.2
d. Prepare seedbeds.	3.1
e. Water lawns.	3.0
f. Mulch planted areas.	2.9
g. Grade, rake, and level lawns.	2.9
h. Aerate lawns.	2.8
i. Recognize common lawn weeds, insects, and diseases.	2.7
j. Spray lawns for weed, insect, and disease control.	2.7
k. Roll newly sodded areas.	2.7
l. Identify lawn grasses.	2.3
m. Take soil samples for testing.	2.3
2. Plant and care for ornamental plantings.	2.8
a. Transplant ball and burlap plants.	3.1
b. Control weeds in plantings.	3.1

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* Responses from 38 Grounds Maintenance Personnel in 20 states. Survey conducted by Division of Resource Management, Agricultural Education, West Virginia University, Morgantown, West Virginia 26506.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

c.	Water ornamental plants.	3.1
d.	Trim and prune trees and shrubs.	3.1
e.	Prepare planting area.	3.0
f.	Cultivate and mulch.	3.0
g.	Protect plants from insect, disease, and rodent damage.	3.0
h.	Transplant bare root plants.	2.9
i.	Recognize environmental requirements of trees, shrubs, flowers, vines, and other plant materials.	2.7
j.	Apply fertilizer and soil amendments.	2.7
k.	Dig and plant bulbs.	2.6
l.	Provide winter protection.	2.6
m.	Plant seeds.	2.5
n.	Brace and repair trees.	2.4
o.	Train espalier trees and shrubs.	2.0
p.	Propagate plants by cuttings, layering, and division.	2.0
3.	Use and maintain hand tools and equipment.	3.5
4.	Operate,.service, and repair power-operated grounds maintenance equipment.	2.5
a.	Operate, adjust, and service lawn mowers and edgers.	3.3
b.	Operate, adjust, and service hedge shears.	3.0
c.	Operate, adjust, and service fertilizer spreaders.	3.0
d.	Operate, adjust, and service tillers and cultivators.	2.9
e.	Operate, adjust, and service sprayers.	2.9
f.	Operate, adjust, and service garden tractors.	2.8
g.	Operate, adjust, and service tractors.	2.8
h.	Operate, adjust, and service seeders.	2.7
i.	Operate, adjust, and service chain saws.	2.7
j.	Operate, adjust, and service dusters.	2.5
k.	Operate, adjust, and service lawn sweeps.	2.4
l.	Operate, adjust, and service trucks.	2.3
m.	Operate, adjust, and service snow plows and blowers.	2.2
n.	Operate, adjust, and service leaf collectors.	2.0
o.	Operate, adjust, and service spreader equipment for chemical snow removal.	1.8
p.	Operate, adjust, and service backhoes.	1.7
q.	Operate, adjust, and service cherry pickers.	1.3
5.	Construct, maintain, and repair and/or install landscape items.	2.0
a.	Keep worksite neat.	3.6
b.	Construct and/or repair fences.	2.4
c.	Install, maintain, and repair drainage systems.	2.3

d.	Install, maintain, and repair irrigation systems.	2.3
e.	Paint landscape structures.	2.2
f.	Mix mortar.	1.8
g.	Build forms for concrete.	1.7
h.	Lay concrete block, stone, and/or brick.	1.7
i.	Place and repair asphalt.	1.7
j.	Mix, place, finish, and cure concrete.	1.6
k.	Install sculpture, statuary, and fountains.	1.5
l.	Build benches and garden furniture.	1.5

LANDSCAPE AIDE

Other Titles: Landscape Worker.

Job Description:

Landscape Aides work under the supervision of crew foremen in establishing a landscape plan. They may assist in grading the site and installing drainage systems, prepare soil for planting, and plant trees, shrubs, grass, and other plant materials, using manual and power operated equipment. They may help construct walks, driveways, pools, and other landscape structures. To enter the job of Landscape Aide, extensive laboratory or field experience in a high school vocational agriculture program of ornamental horticulture will be helpful.

Competencies Identified and Validated

N = 24*

Competencies	Weighted Mean**
1. Prepare landscape area.	2.6
a. Grade landscape site.	3.3
b. Cut and remove trees and shrubs.	2.7
c. Remove rocks and debris.	2.6
d. Install drain tile.	2.2
e. Install irrigation system.	1.9
2. Plant trees, shrubs, groundcovers, and flowers.	3.1
a. Prepare holes for transplanting trees and shrubs.	3.7
b. Apply fertilizer and soil amendments.	3.5
c. Plant, ball, and burlap plants.	3.5
d. Wrap and stake trees.	3.5
e. Prune and trim newly planted trees and shrubs.	3.4
f. Apply mulching materials.	3.3
g. Water plants and beds.	3.3
h. Plant bare root plants.	3.0
i. Prune roots of bare root plants.	2.9
j. Prepare seedbeds for seeds, bulbs, and cuttings.	2.7
k. Plant seed and bulbs.	2.6
l. Plant cuttings.	2.0
3. Plant and renovate turf and lawn area.	2.8
a. Lay sod.	3.2
b. Incorporate starter fertilizers.	3.1
c. Plant seed.	3.1

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* Responses from 24 Landscape Contractors in 16 states. Survey conducted by Division of Resource Management, Agricultural Education, West Virginia University, Morgantown, West Virginia 26505.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

	d.	Prepare the seedbed by tillage.	2.9
	e.	Apply lime and fertilizers.	2.9
	f.	Water lawn area.	2.9
	g.	Roll lawn area.	2.8
	h.	Mulch planted area.	2.8
	i.	Sterilize soil.	2.0
	j.	Plant stolons (spriggs).	1.7
4.	Construct landscape structures and conveniences.		1.6
	a.	Build forms for concrete.	1.8
	b.	Lay concrete block, stone, and/or brick.	1.8
	c.	Install fountains and pools.	1.8
	d.	Construct fences.	1.7
	e.	Mix, place, finish, and cure concrete.	1.7
	f.	Mix mortar.	1.6
	g.	Build benches and lawn furniture.	1.4
	h.	Paint landscape structures.	1.3
5.	Operate, adjust, and service equipment.		2.6
	a.	Operate and service trucks.	3.1
	b.	Operate, adjust, and service tillers and cultivators.	3.1
	c.	Operate, adjust, and service garden tractors.	2.9
	d.	Operate, adjust, and service chain saws.	2.8
	e.	Operate, adjust, and service large tractors.	2.7
	f.	Operate, adjust, and service seed and fertilizer distributors.	2.7
	g.	Operate, adjust, and service loaders.	2.4
	h.	Operate, adjust, and service levelling blades.	2.2
	i.	Operate and service lawn rollers.	2.2
	j.	Operate, adjust, and service back hoes.	2.0

RETAIL LANDSCAPE AND GARDEN CENTER SALESPERSON

Job Description:

The Retail Landscape and Garden Center Salesperson has knowledge of both horticultural and business skills. The salesperson possesses desirable personal qualities which enable him/her to effectively represent the business and to successfully complete business transactions. The Salesperson understands the culture of various horticultural crops which may be used by the home gardener. In addition, the employee cares for and maintains plant materials which are marketed in the garden center.

Competencies Identified and Validated

N = 32*

Competencies		Weighted Mean**
1.	Personal qualities and qualifications.	3.2
a.	Demonstrate the desire to work.	3.5
b.	Demonstrate the ability to get along with others.	3.4
c.	Demonstrate the ability to project a desirable image for the business.	3.4
d.	Maintain a satisfactory attendance record.	3.4
e.	Demonstrate a willingness to learn.	3.4
f.	Demonstrate the ability to work independently.	3.2
g.	Demonstrate the ability to follow directions of supervisor.	3.2
h.	Demonstrate acceptable personal appearance and personal hygiene.	3.1
i.	Understand needs of customers.	3.1
j.	Demonstrate attitudes of customers and discuss with supervisor when necessary.	2.8
2.	Merchandising and selling skills.	2.4
a.	Approach customer.	3.2
b.	Provide information and answers.	3.2
c.	Determine needs of customer.	3.1
d.	Operate sales equipment (cash register, calculator, charge equipment, receipts).	3.0

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* Responses from 32 Garden Center Sales Persons and Managers in 24 states. Survey conducted by the Department of Agricultural and Extension Education, Department of Horticulture, University of Maryland, College Park, Maryland 20742.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

e.	Set up new materials on shelves in greenhouse or nursery for sale.	2.7
f.	Package and/or wrap merchandise for customers.	2.7
g.	Receive and unpack shipments of new materials.	2.5
h.	Develop displays.	2.2
i.	Demonstrate desirable telephone skills.	2.2
j.	Complete arrangements for financing.	2.0
k.	Label materials with information concerning care and price.	2.0
l.	Make inventory of stock.	1.8
m.	Make delivery arrangements.	1.2
3.	Culture of fruits for the home garden.	2.9
a.	Recommend type of fertilizer.	3.0
b.	Diagnose insect and disease problems.	3.0
c.	Recommend control for insect and disease problems.	3.0
d.	Identify and be familiar with the care and culture of fruit crops grown locally.	2.8
e.	Recommend time of year in which pruning should be done.	2.7
f.	Recommend rates needed for fruit crops.	2.6
g.	Recommend application time.	2.5
h.	Describe purpose of pruning.	2.5
i.	Describe specific pruning techniques including type of cuts to be made and location on plant.	2.5
j.	Advise customer of federal laws concerning pesticide use.	2.5
k.	Plant various specimens.	2.5
l.	Recommend layout of plants for the home fruit garden.	2.3
m.	Recommend soil preparation techniques.	2.0
4.	Culture of ornamentals for the home garden.	2.8
a.	Identify and be familiar with the care and culture of trees, shrubs, and vines grown locally.	3.5
b.	Recommend watering techniques.	3.2
c.	Identify and be familiar with the care and culture of bedding plants grown locally.	3.1
d.	Recommend planting practices.	3.1
e.	Recommend types of fertilizer needed for various plants.	3.0
f.	Diagnose insect and disease problems.	3.0
g.	Recommend control for insect and disease problems.	2.9
h.	Recommend timing of fertilizer applications.	2.9

	i.	Identify and be familiar with the care and culture of foliage plants.	2.9
	j.	Recommend application rates for fertilizers.	2.8
	k.	Recommend cultural practices for interior gardening, such as watering and fertilizing.	2.7
	l.	Recommend timing of pruning practices.	2.7
	m.	Describe purpose of various types of pruning.	2.6
	n.	Advise consumer of federal laws concerning pesticide use.	2.4
	o.	Describe specific pruning techniques including type of cuts to be made and location on plant.	2.4
	p.	Recommend desirable environmental conditions needed for interior gardening.	2.2
	q.	Recommend liming procedures.	2.2
	r.	Identify and be familiar with the care and culture of specialty greenhouse crops, such as poinsettias and lilies.	2.2
5.	Culture of vegetables for the home graden.		2.7
	a.	Identify and be familiar with the care and culture of vegetable crops grown locally.	2.9
	b.	Recommend varieties suitable for the particular location.	2.8
	c.	Recommend types of fertilizers needed for vegetable crops.	2.8
	d.	Recommend planting procedures.	2.8
	e.	Recommend watering practices.	2.8
	f.	Diagnose insect and disease problems.	2.8
	g.	Prescribe control for insect and disease problems.	2.8
	h.	Recommend application rates for fertilizers.	2.7
	i.	Recommend timing of fertilizer applicators.	2.7
	j.	Describe use of soil additives such as manure.	2.7
	k.	Recommend weed control practices.	2.4
	l.	Advise consumer of federal laws concerning the use of pesticides.	2.4
	m.	Recommend liming practices.	2.3
6.	Turf practices for the home gardener.		2.8
	a.	Recommend type of fertilizer to be used for turf.	3.0
	b.	Recommend application time.	2.9
	c.	Recommend rate of application.	2.9
	d.	Recommend weed control program.	2.9
	e.	Recommend control for insect and disease problems.	2.9

f.	Describe seeding procedures.	2.9
g.	Diagnose insect and disease problems.	2.8
h.	Identify and be familiar with turf types grown locally.	2.8
i.	Describe purpose and use of soil conditioners.	2.7
j.	Advise consumer of federal laws concerning the use of pesticides.	2.4
k.	Recommend liming practices.	2.3
l.	Describe sodding techniques.	2.3
m.	Describe plugging procedures.	1.9
7.	Garden shop maintenance skills.	2.7
a.	Follow safety recommendations when applying chemicals.	3.2
b.	Water plant material with hose.	3.1
c.	Apply fertilizer to greenhouse material.	2.9
d.	Diagnose insect problems.	2.9
e.	Diagnose disease problems caused by bacteria, fungi, etc.	2.8
f.	Diagnose disease problems or damage caused by poor environmental conditions.	2.8
g.	Prescribe control for insect and disease problems.	2.8
h.	Apply fertilizer to nursery material.	2.8
i.	Report greenhouse plant material.	2.8
j.	Prune and shape nursery material.	2.7
k.	Provide winter protection for nursery material.	2.7
l.	Containerize nursery material.	2.6
m.	Prepare soil mixes.	2.5
n.	Prune and shape greenhouse crops.	2.4
o.	Apply pesticides in greenhouse and nursery.	2.4
p.	Operate automatic watering system.	2.2
q.	Sterilize soil mixes.	2.0

NURSERY WORKER

Job Description:

Nursery Workers grow seedlings and plants for landscaping, fruit farming, and forest replanting. They work under the supervision of nursery foremen and must know plant materials and cultural techniques. They need to know how to operate and maintain special equipment such as mowers, tillers, tractors, diggers, and hand tools used in the nursery business. A Nursery Worker prepares seedbeds, plants seedlings, prepares cuttings for rooting, weeds, cultivates, waters, prunes, and may perform other cultural practices, such as spraying, fertilizing, mulching, and grafting. They may dig and pack plants for shipment, and may transplant trees and shrubs. They may also help with construction, maintenance, and repair of buildings and equipment.

Competencies Identified and Validated

N = 34*

		Competencies	Weighted Mean**
1.		Prepare growing mediums and seedbeds.	2.5
	a.	Apply chemicals to control weeds and/or soil insects.	3.0
	b.	Dig holes for trees and shrubs (hand and power equipment).	2.7
	c.	Operate tillage machinery.	2.6
	d.	Mix and sterilize greenhouse and coldframe mediums.	2.5
	e.	Haul and spread peat moss and other plant materials.	2.3
	f.	Operate lime and/or fertilizer spreaders.	2.2
	g.	Lay out space requirements for various varieties.	2.2
	h.	Take soil samples.	2.0
2.		Propagate nursery stock.	2.7
	a.	Prepare cuttings.	3.0
	b.	Transplant seedlings and cuttings to the field.	3.0
	c.	Clean, treat, and plant seed.	2.7
	d.	Start and care for container stock.	2.7
	e.	Label planted rows or areas.	2.5
	f.	Bud and graft nursery stock.	2.4
3.		Culture plants in the nursery.	2.8

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* Responses from 34 Nursery Operators in 25 states. Survey conducted by Division of Resource Management, Agricultural Education, West Virginia University, Morgantown, West Virginia 26505.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

a.	Water nursery stock.	3.4
b.	Prune and trim plants.	3.2
c.	Prepare cuttings.	3.1
d.	Operate sprayers and dusters.	3.0
e.	Thin and space nursery stock.	3.0
f.	Identify and remove diseased and dead plants.	3.0
g.	Identify common weeds, insects, and diseases.	2.9
h.	Cultivate with hand and power equipment.	2.8
i.	Mulch nursery stock.	2.3
j.	Lay plastic for weed control.	2.0
k.	Set traps and poisons for pests.	1.9
4.	Harvest nursery stock.	2.7
a.	Dig stock with hand and power equipment.	3.3
b.	Ball and burlap stock.	3.0
c.	Label harvested plants.	3.0
d.	Pot plants for retail sale.	2.3
e.	Harvest and clean seed.	2.0
5.	Store nursery stock.	2.2
a.	Remove dead or inferior plants.	2.5
b.	Maintain humidity and temperature requirements.	2.4
c.	Care for over-wintering of container stock.	2.2
d.	Label storage bins and bags.	2.1
e.	Bunch and pack plants.	2.0
f.	Deliver plants to warehouse.	1.7
6.	Process and ship nursery stock.	2.3
a.	Package orders for shipment.	2.5
b.	Prepare shipping labels and invoices.	2.3
c.	Deliver plant materials to wholesalers and/or retailers.	2.1
7.	Maintain buildings and equipment.	2.2
a.	Keep work, storage, and delivery areas neat and clean.	3.2
b.	Clean and sharpen hand tools.	3.0
c.	Maintain and service business vehicles and/or tractors.	2.8
d.	Maintain and service power tillers, mowers and cultivators.	2.8
e.	Maintain and service tractor operated equipment.	2.7
f.	Maintain and install sprinkler heads, pipe nozzles and other irrigation equipment.	2.5
g.	Clean, adjust, and service dusters, and sprayers.	2.4
h.	Maintain and adjust small gas engines.	2.1
i.	Repair storage buildings, bins and equipment (carpentry).	1.9
j.	Maintain and service water valves, spigots, and pumps.	1.8
k.	Paint nursery house and storage buildings.	1.7
l.	Clean and oil electric motors.	1.6
m.	Service heating pots and boilers.	1.5

n.	Install and repair light switches, receptacles, and extension cords.	1.3
o.	Mix, place, and finish concrete.	1.2

PLANT PROPAGATOR

Job Description:

Plant Propagators are responsible to nursery superintendents or the nurserymen. They start new plants from seeds, cuttings, grafting, or other means. They may have several foremen and/or a number of workers in their charge. They must know the cultural techniques of propagating various kinds of woody and herbaceous plants; be capable of managing greenhouses, hotbeds and outdoor seed beds; and have a thorough knowledge of insect and disease control. They must also plan propagation schedules and be able to identify plants readily. The Plant Propagator has generally received training beyond the high school level.

Competencies Identified and Validated

N = 24*

Competencies		Weighted Mean**
1.	Plan propagation schedules.	3.2
2.	Prepare planting media.	2.7
	a. Determine outdoor seedbed preparation techniques.	3.0
	b. Lay out space requirements for various varieties.	2.9
	c. Determine soil mix for specific plant requirements.	2.9
	d. Determine fertilizer requirements.	2.9
	e. Determine chemicals to use in control of weeds, diseases, and/or soil insects.	2.9
	f. Sterilize soil, media, and/or containers.	2.7
	g. Determine bed arrangements.	2.7
	h. Select nursery planting site.	2.3
	i. Test soil for N.P.K. and soluable salts.	2.1
3.	Propagate by seed.	2.8
	a. Plant seed.	3.1
	b. Label planted rows or areas.	3.1
	c. Water seedlings.	3.0
	d. Identify seeds.	2.9
	e. Fertilize seedlings.	2.9
	f. Transplant seedlings to pots or field.	2.8
	g. Select sources of seed.	2.7
	h. Treat seed.	2.7
	i. Select and use tools, materials, containers, and equipment used in seedage.	2.5

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* Responses from 24 Nursery Operators in 21 states. Survey conducted by Division of Resource Management, Agricultural Education, West Virginia University, Morgantown, West Virginia 26506.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

NURSERY MECHANIC

Job Description:

Nursery Mechanics are responsible for maintaining mechanical equipment and structures. They service and repair vehicles, power units, and machinery used in the nursery business and may fabricate, maintain, and repair metal, wood, and concrete structures and equipment. They may install and maintain electrical wiring and equipment, water and steam pipes, and irrigation devices. Their job requires extensive knowledge of the care and use of hand and power tools.

Competencies Identified and Validated

N = 21*

Competencies			Weighted Mean**
1.	Maintain tractors, trucks, fork lifts, and business vehicles.		3.3
	a.	Service lubrication systems.	3.5
	b.	Service air intake and carburation systems.	3.4
	c.	Service hydraulic systems.	3.4
	d.	Maintain tires.	3.4
	e.	Service cooling systems.	3.3
	f.	Service electrical and ignition systems.	3.1
2.	Maintain small-engine operated equipment.		3.0
	a.	Service and repair small-engine operated sprayers and dusters.	3.2
	b.	Service, repair, and adjust power tillers and cultivators.	3.1
	c.	Adjust, repair, and sharpen chain saws.	2.9
	d.	Service air compressors and pneumatic powered equipment.	2.8
	e.	Service, repair, and adjust turf and lawn cutting equipment.	2.8
	f.	Service and repair small-engine operated fertilizer and seed spreaders.	2.8
3.	Clean, adjust, and repair small gasoline engines.		3.8
4.	Maintain tractor-operated field equipment.		3.2
	a.	Adjust, repair, and service fertilizing equipment.	3.3
	b.	Adjust, repair, and service planting equipment.	3.2

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* Responses from 21 Nursery Operators in 17 states. Survey conducted by Division of Resource Management, Agricultural Education, West Virginia University, Morgantown, West Virginia, 26506.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

	c.	Adjust, repair, and service spraying equipment.	3.2
	d.	Adjust, repair, and service tillage equipment.	3.2
	e.	Adjust, repair, and service cultivation equipment.	3.2
5.		Repair and construct special nursery items.	2.3
	a.	Arc weld metal structures.	2.7
	b.	Braze, cut, and weld with oxyacetylene equipment.	2.7
	c.	Repair and build wooden frames, benches, and other nursery structures.	2.6
	d.	Mix, place, and finish concrete.	2.1
	e.	Install and glaze glass.	2.1
	f.	Figure bills of materials.	1.9
	g.	Lay brick and concrete block.	1.8
6.		Use and maintain hand tools and portable power equipment.	3.2
7.		Install and maintain electrical systems.	2.4
	a.	Replace fuses.	2.6
	b.	Clean and oil electric motors.	2.5
	c.	Install and replace switches, receptacles, and other electrical devices.	2.4
	d.	Install electrical wiring.	2.1
8.		Install and maintain plumbing systems.	2.2
	a.	Maintain water delivery devices for greenhouse and outdoor irrigation systems.	2.7
	b.	Select and install copper, steel, and plastic pipe and fittings.	2.2
	c.	Maintain steam generators.	2.0
	d.	Replace fuses.	2.0
9.		Keep work and storage areas in the nursery maintenance shop clean and orderly.	3.7
10.		Observe safety rules and regulations.	3.9

NURSERY SALESPERSON - RETAIL

Job Description:

Nursery Salespersons are directly responsible to office managers. They must be able to identify all the plant material produced and/or sold by their firm and appropriate uses for it. They must know sizes and grades of stock and current prices. They may advise customers concerning planting techniques and cultural practices required for successful growing of plant materials they sell. They may arrange displays of plants and related items, and prepare advertising announcements for various media. They must have sales ability and enjoy dealing with customers. Most Nursery Salespersons have had nursery experience and training beyond the high school level.

Competencies Identified and Validated

N = 41*

Competencies	Weighted Mean**
1. Demonstrate knowledge of nursery retail outlet products.	3.0
a. Identify nursery plants.	3.7
b. Advise customer of correct manner of planting and caring for plant materials.	3.6
c. Recognize common plant insect and disease problems and advise customers concerning insecticide and fungicide use.	3.3
d. Advise customers concerning fertilizer types, rates, and methods of application for various plants.	3.3
e. Explain environmental requirements of various plants.	3.2
f. Explain appropriate uses and qualities of nursery stock.	3.2
g. Recommend appropriate herbicides.	3.1
h. Explain values of various mulching materials and soil amendments.	3.0
i. Explain plant differences according to USA standard grades.	2.0
j. Explain application and care of garden tools and equipment.	2.0
2. Demonstrate effective sales techniques.	3.0

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* Responses from 41 Nursery Sales Outlet Personnel in 28 states. Survey conducted by Division of Resource Management, Agricultural Education, West Virginia University, Morgantown, West Virginia 26506.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

a.	Greet customers in courteous manner.	3.8
b.	Close sales efficiently.	3.6
c.	Identify wants and needs of customers.	3.5
d.	Fill out appropriate sales forms.	3.3
e.	Gain attention and interest of customer.	3.3
f.	Handle customer objections and complaints.	3.2
g.	Direct attention to related or substitute products.	3.1
h.	Make change.	2.8
i.	Handle complaints after sale is made.	2.8
j.	Use cash register.	2.7
k.	Follow up sales to determine customer satisfaction.	2.6
l.	Packs and/or wraps merchandise.	2.3
m.	Take orders by telephone.	2.3
n.	Solicit sales by telephone.	1.5
3.	Price stock (figure margins and markup).	2.1
4.	Maintain inventory of stock and related items.	2.3
5.	Prepare advertising announcements for various media.	1.1
a.	Prepare newspaper advertisments.	1.2
b.	Prepare mailers for local distribution.	1.0
c.	Prepare radio commercials.	1.0
d.	Prepare T.V. commercials.	.9
6.	Prepare merchandise displays.	2.8
a.	Remove wilted stock from displays.	3.4
b.	Present merchandise in attractive displays.	2.9
c.	Display seasonal promotional items.	2.8
d.	Suggest related items to customers with related merchandise displays.	2.8
e.	Change displays frequently.	2.7
f.	Arrange outside displays to attract customers.	2.7
g.	Display merchandise as it can be used.	2.6
h.	Include sales information in displays.	2.6

GOLF COURSE MAINTENANCE WORKER

Other Titles: Greenskeeper II, Golf Course Laborer.

Job Description:

Golf Course Maintenance Workers must be trained to do many different things. Once on the job they may be assigned a few specific tasks, achieving a certain amount of specialization. This would be true especially on the larger golf courses. Golf Course Maintenance Workers must, therefore, be prepared to do almost any of the kinds of work involved in, and essential to golf course maintenance operations. These tasks may include the mowing of greens, collars, aprons, fairways, and roughs; relocation of tee markers and cups, the raking of sand traps; assisting in the repair and servicing of various types of tools and equipment, and the performing of a great many other related duties. The more complex of these duties include construction of drainage facilities and the installation and repair of irrigation systems. In most golf course operations Maintenance Workers will be responsible to and work under the direct supervision of the golf course superintendents or other supervisory persons.

Competencies Identified and Validated

N = 30*

Competencies		Weighted Mean**
1.	Maintain greens and tees.	2.9
a.	Mow greens.	3.7
b.	Mow collars.	3.7
c.	Mow aprons.	3.7
d.	Relocate cups.	3.7
e.	Replace tee markers.	3.7
f.	Relocate tee markers.	3.3
g.	Repair divots.	3.0
h.	Service and maintain ball washers.	3.0
i.	Repair benches.	3.0
j.	Apply fertilizer to greens.	2.9
k.	Apply fungicides.	2.9
l.	Aerify turf.	2.9
m.	Apply herbicides (granules).	2.8
n.	Verticut turf.	2.8
o.	Apply topdressing.	2.7
p.	Overseed turf.	2.7

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* Responses from 30 Golf Course Maintenance Workers in the Southeastern part of the United States. Survey conducted by Department of Agricultural and Extension Education, University of Florida, Gainesville, Florida 32601.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

q.	Apply herbicides (liquid spray).	2.7
r.	Irrigate greens (manual system).	2.7
s.	Report insect damage.	2.5
t.	Mix herbicides.	2.4
u.	Mix insecticides.	2.4
v.	Mix fungicides.	2.4
w.	Report diseased turf.	2.2
x.	Report weed infestations.	2.2
2.	Maintain fairways, roughs, and traps.	3.1
a.	Add sand to traps.	3.6
b.	Hand rake sand traps.	3.6
c.	Re-establish turf by sprigging.	3.4
d.	Apply fertilizer to fairways.	3.3
e.	Mow fairways.	3.3
f.	Trim sand traps.	3.1
g.	Edge sand traps.	3.1
h.	Re-establish turf by sodding.	3.0
i.	Mow roughs.	2.9
j.	Power rake sand traps.	2.4
k.	Irrigate fairways (manual system).	2.4
3.	Carry out miscellaneous maintenance operations.	2.7
a.	Prune trees and shrubs.	3.1
b.	Remove trees and shrubs.	2.9
c.	Repair cart paths.	2.8
d.	Cut sod (operate sod cutter).	2.8
e.	Plant trees and shrubs.	2.7
f.	Mow and edge lake banks.	2.7
g.	Repair golf course signs.	2.7
h.	Trim (mow) banks of water hazards.	2.6
i.	Install tile drains.	2.6
j.	Apply herbicides for weed control in ponds and lakes.	2.3
4.	General maintenance of buildings and equipment.	2.8
a.	Clean hand tools and equipment.	3.7
b.	Check oil in motors of power driven turfgrass equipment.	3.5
c.	Clean mower blades.	3.3
d.	Sharpen hand tools.	3.3
e.	Pick up litter from grounds and playing areas.	3.2
f.	Sharpen mower blades.	3.0
g.	Clean spraying equipment.	3.0
h.	Check radiator on equipment.	2.9
i.	Check tires and tire pressure.	2.7
j.	Check battery on equipment.	2.7
k.	Grease tractors and other equipment.	2.4
l.	Repair irrigation pipes.	2.4
m.	Install irrigation valves.	2.4
n.	Change engine oil and filters.	2.2

o.	Extend irrigation systems.	2.1
p.	Tune up motors on equipment.	2.0
q.	Order repair parts.	2.0

MAINTENANCE WORKER - MUNICIPAL PARKS AND RECREATION AREAS

Job Description:

Working under the direct supervision of a Work Foreman or Crew Leader, Maintenance Workers perform a variety of tasks assigned to them. They plant, irrigate, mow, and trim grass; apply fertilizer and pesticides, cut and pull weeds, plant and prune trees and shrubs, take soil samples, maintain paths and walks, plant and care for flowers, and perform a variety of different kinds and pieces of equipment. They are required to service and maintain all of the tools and equipment they use. They should be trained in one or more areas of Ornamental Horticulture and must be able to get along well with others.

Competencies Identified and Validated

N = 30*

Competencies	Weighted Mean**
1. Effectively till the soil and establish seedbed.	3.1
a. Apply lime and/or other soil amendments.	3.5
b. Plow, roto till or otherwise prepare land.	3.5
c. Level and smooth land preparatory to planting.	3.1
d. Apply fertilizers according to soil test results.	2.1
2. Plant grass, flowers, trees, and shrubs.	2.2
a. Eliminate weeds in newly planted areas.	3.7
b. Lay sod.	3.1
c. Seed or transplant flowers.	3.1
d. Apply supplemental fertilizer to planted areas as needed.	3.1
e. Plant and/or transplant trees and shrubs.	3.0
f. Roll newly planted sod or turf.	3.0
g. Plant grass by seeding, sprigs, and/or plugs.	2.7
h. Irrigate newly planted or established areas.	2.3
i. Lay out land for planting according to space and landscape requirements.	1.8
3. Maintain established turfgrass areas.	2.6
a. Apply fertilizers to lawns and/or other turfgrass areas.	3.5
b. Control insects, fungi, and weed pests.	3.4

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* Responses from 30 Maintenance Workers in the southeastern part of the United States. Survey conducted by Department of Agricultural and Extension Education, University of Florida, Gainesville, Florida 32601.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

c.	Mow lawns and other turfgrass areas.	3.3
d.	Irrigate lawns and/or other turfgrass areas periodically as required.	2.8
e.	Slice or otherwise renovate turf as conditions require.	2.3
f.	Roll established turfgrass areas.	2.2
g.	Aerify established turf as necessary.	2.2
h.	Overseed established turfgrass areas.	2.1
i.	Apply topdressing as conditions require.	1.7
4.	Maintain trees, shrubs, and flowers.	2.9
a.	Apply fertilizers as needed.	3.5
b.	Control weeds, insects, and other pests.	3.2
c.	Irrigate trees, shrubs, and flowers as needed.	3.0
d.	Remove trees and shrubs.	2.9
e.	Trim trees, flowers, and shrubs.	2.6
f.	Provide support for trees as needed.	2.5
g.	Prune trees and shrubs.	2.3
5.	Carry out general grounds maintenance operations.	2.6
a.	Pick up paper, trash, and other refuse and keep grounds neat and clean.	2.8
b.	Clean drainage ditches and culverts.	2.6
c.	Repair and maintain walks and paths.	2.6
d.	Paint, mend, and otherwise repair benches, fences, signs, buildings, and storage areas.	2.6
e.	Maintain ponds, lakes and waterways.	2.5
6.	Service and maintain tools and equipment.	3.4
a.	Check oil, tire pressure, radiators, and batteries in all vehicles used.	3.6
b.	Clean all tools and equipment following use.	3.5
c.	Sharpen, service and/or adjust hand tools, lawn mowers and all other essential cutting equipment.	3.3
d.	Clean, repair and otherwise adequately service dusters, chemical sprayers, and fertilizer applicators.	3.3

WORK FOREMAN - MUNICIPAL PARKS AND RECREATIONAL AREAS

Other Titles: Head Groundskeeper, Work Supervisor.

Job Description:

Duties and responsibilities of Work Foremen vary slightly from one kind of operation to another depending on the nature and size of the facility. Normally Work Foremen are responsible to City Managers or some other persons who are appointed to be in charge of a given facility. Generally speaking Work Foreman are responsible for all planting and groundskeeping operations. They supervise laborers and other maintenance workers in the planting and pruning of trees and shrubs, in the application of fertilizers, in irrigating grass, flowers and trees, in cutting grass, in the maintenance of walks and paths and in performing all similar kinds of work required to maintain a facility in good order. They are familiar with all kinds of planting and maintenance equipment and are able to demonstrate its use to others. They assign work responsibilities to members of the work crew and checks and supervise them effectively in work performance. They must be able to get along and communicate effectively with their subordinates as well as with their superiors. Normally their training and experience is in Ornamental Horticulture or Agronomy.

Competencies Identified and Validated

N = 30*

Competencies	Weighted Mean**
1. Observe the work in progress and take the necessary precautions to insure the safety of workers and the quality of work performed.	3.8
2. Report any special problems to the supervisor and counsel with the supervisor in their solution.	3.6
3. Direct and supervise workers in mowing of turfgrass areas, in the application of fertilizer, pesticides, irrigation, and water for city parks, sports complexes, or recreation areas.	3.5
4. Arrange for the availability of all tools and equipment when needed and make sure that all tools and equipment used on the job are kept clean and in a good state of repair.	3.1

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* Responses from 30 Work Foremen of Municipal Parks and Recreational Areas in the southeastern part of the United States. Survey conducted by Department of Agricultural and Extension Education, University of Florida, Gainesville, Florida 32601.

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5.	Appraise the time required for doing the various jobs and tasks needing to be done and make manpower assignments accordingly.	3.0
6.	Demonstrate the effective use of most tools and pieces of equipment operated by personnel.	2.9
7.	Fill in for the supervisor as occasion demands and perform other related work as required.	2.8
8.	Recommend and initiate personnel action such as promotion, discharges, disciplinary measures, and transfers for personnel.	2.8
9.	Maintain time records on personnel assigned as well as a time breakdown on jobs assigned.	1.9
10.	Recommend the purchase of new and useful equipment considered necessary for doing a good and efficient job.	1.5

GOLF COURSE MECHANIC

Job Description:

Golf Course Mechanics are directly responsible to the Golf Course Superintendent. They diagnose, repair, service, adjust, and maintain all kinds of engines and other equipment used on the golf course. They should be competent and skillful in all these areas and especially in the sharpening and adjustment of blades and cutting bars on all types of special turf mowers used on the golf course. They are responsible for keeping all types of equipment in a good state of repair and ready for use.

Competencies Identified and Validated

N = 30*

Competencies	Weighted Mean**
1. Repair, service, and maintain small engines, self-propelled and tractor drawn mowers, chemical sprayers, fertilizer spreader, golf carts, and other golf course machinery and equipment.	3.8
2. Tune engines on tractors and other self-propelled equipment.	3.8
3. Keep manuals and parts catalogs available for use in adjustment of different pieces of equipment and for ordering replacement parts as needed.	3.7
4. Maintain a clean shop area.	3.7
5. Repair and service hydraulic systems.	3.5
6. Keep mower blades properly sharpened, and maintain all other types of machinery and equipment in good working order.	3.5
7. Keep inventories of supplies and materials needed to maintain machinery and equipment.	3.5
8. Maintain records on hours of equipment use, oil changes, engine fuel consumption, etc.	3.3
9. Do welding, acetylene burning, brazing, and soldering as required.	3.3
10. Overhaul small engines.	2.2
11. Service, maintain, and repair irrigation equipment.	2.1

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* Responses from 30 Golf Course Mechanics in the southeastern part of the United States. Survey conducted by Department of Agricultural and Extension Education, University of Florida, Gainesville, Florida 32601.

** 4.0 = Essential; 3.0 = Important; 2.0 = Of Some Importance; 1.0 = Not Important; 0 = Does Not Apply.

GOLF COURSE PESTICIDE SPECIALIST

Job Description:

Golf Course Pesticide Specialists must be knowledgeable in regard to the effective and safe use of all pesticides. They decide what herbicides, fungicides, and insecticides are to be used on the golf course and closely supervise their use and application. They are licensed under EPA laws and regulations and should be able to communicate and get along well with subordinates, peers, and superiors.

Competencies Identified and Validated

N = 30*

Competencies	Weighted Mean**
1. Identify and report weeds, insects, and diseased turf problems.	3.8
2. Apply chemicals to control weeds, and/or turf diseases.	3.8
3. Mix chemicals for spraying insects, weeds, and/or diseased turf.	3.7
4. Remove aquatic weeds from ponds or lakes.	3.2
5. Trap rodents.	2.8
6. Poison rodents and insects.	2.7

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* Responses from 30 Golf Course Pesticide Specialists in the Southeastern part of the United States. Survey conducted by Department of Agricultural and Extension Education, University of Florida, Gainesville, Florida 32601.

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GOLF COURSE WORK FOREMAN

Job Description:

Golf Course Maintenance Foremen work under Golf Course Superintendents and are responsible to the superintendent for all maintenance operations. They need to be able to handle, service, and operate all the tools and equipment required in doing the work. They must know the game of golf, and especially, they need to understand the importance of carrying out all maintenance work in a precise and timely manner. They are responsible for anticipating the needs of crew members for tools and equipment and for scheduling the needed tools and equipment in advance. Golf Course Work Foremen need to be good organizers and be able to instruct and communicate effectively with the maintenance personnel whose work they assign and for which they are responsible as well as with the Golf Course Mechanic and other cooperating personnel. They must be able to get along with crew members, keeping them happy and effectively employed in performing the more or less routine maintenance tasks assigned.

Competencies Identified and Validated

N = 30*

Competencies		Weighted Mean**
1.	Instruct and supervise Golf Course Crew Workers in the performance of jobs assigned to them.	3.9
2.	Demonstrate the effective and efficient use of all tools and/or equipment used in golf course maintenance operations where new employees are involved and when other circumstances require it.	3.8
3.	Be responsible not only for quantity of work done by crew members, but also for the quality of this work and getting it done according to schedule.	3.5
4.	Promote good human relations and correct any negative factors influencing worker cooperation and performance.	3.5
5.	Be resourceful and exercise initiative within the limits of existing policy.	3.4
6.	Be responsible for care and use of all equipment assigned to his personnel.	3.3

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* Responses from 30 Golf Course Work Foremen in the southeastern part of the United States. Survey conducted by the Department of Agricultural and Extension Education, University of Florida, Gainesville, Florida 32601.

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7. Be responsible for the availability of tools and equipment needed by workers and also for its proper use and care. 3.0

8. Keep time records and a time breakdown on job assignments. 2.9

GOLF COURSE IRRIGATION SPECIALIST

Job Description:

Golf Course Irrigation Specialists are directly responsible to the Golf Course Superintendent. They must have a good knowledge of all types of irrigation systems used in modern golf course operations and be able to calculate turf moisture requirements for variable climatic and soil conditions. They decide how much irrigation water should be applied, when it should be applied, and either apply or effectively supervise its application in accordance with turf and soil moisture requirements. Also, they must have the ability to adjust and/or supervise the adjustment of time clocks, cycling schedules, irrigation pumps and all other mechanical operations of a system. They should be competent and correct in counciling and giving direction to the work foreman in the repair and maintenance of all kinds of golf course irrigation systems, being able to diagnose problems in an irrigation system and correct them.

Competencies Identified and Validated

N = 30*

	Competencies	Weighted Mean**
1.	Work closely with golf course superintendents and keep them duly informed of any irrigation problems which are or might be critical to the successful operation of the golf course.	3.8
2.	Operate time controlled automatic irrigation systems and personally supervise the operation of manual systems where they exist.	3.7
3.	Check, maintain, and supervise the repair of all automatic irrigation systems components.	3.7
4.	Be responsible for the irrigation of golf greens and fairways usually involving an automatic time controlled system.	3.7
5.	Perform related duties as required.	3.6
6.	Maintain a full log and watering schedule for all turf areas.	3.5
7.	Keep daily and year round rainfall records.	3.5

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8.	Maintain an adequate supply of valves, couplings, pipes, and other parts needed for the effective and efficient operation of the system.	3.5
9.	Install additions and extensions to existing irrigation systems as necessary.	3.3
10.	Check moisture penetration as necessary and maintains a regular watering schedule.	3.3
11.	Check, maintain, and supervise the repair of all golf course drainage installations.	2.9